# The Builder.

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*Epilogue.*

THE close of the year 1871 suggests one of those welcome but not altogether reassuring lulls that are at times interposed between distinct paroxysms of the fury of a typhoon. In England, indeed (and we can never be sufficiently thankful for the fact), we seem to have lain towards the outer limits of the atmospheric disturbance. The storm-path has not held its deadly way across our shores, nor have we had to gaze upon the devastated crops, uptorn forests, and roofless dwellings, that have borne witness of its visit to our neighbours. Yet we have not been without menacing symptoms of our proximity to the central line of the cyclone. Nor is the illustration thus drawn from the storm-chart purely allegorical. Vessels have been known to sail within the course of one of these great atmospheric revolutions, dipping in and out of the whirlwind from their ignorance of those laws of the wind which we are only beginning to comprehend; and there is very much in our present position to recall this unsatisfactory buffeting of the ungeometric mariner.

As compared with the Christmas of 1870, however, Europe may now be said to be at peace. When the year 1871 began, the great German host lay leagues around Paris. The humane sympathies of the English people were stirred by the sufferings of the gay and beautiful city, by the distress of the peasant farmers, whose agriculture bore only blasted crops, and by the unavoidable sufferings of the wounded soldiers. Our sympathy took a material expression that many have good cause to remember; although it was charity of that species that can only be its own reward; and although it is in contradiction to the most generally accepted theories, that war will most rapidly burn itself out if left to its own course, to attempt to diminish its pressure at the same time on either side.

The mingled feelings of sympathy with the conquered, and of half admiration, half indignation at the conquerors, that filled almost every mind at the commencement of the year, were banished by events of an order that paled the crimson lightnings of war. Resistence against overpowering odds has always a certain claim on the respect of the generous mind. But when the blind fury of political passion was carried to an extent that caused the German foe to be regarded as a respecter of humanity, and a protector of order, our ears ceased to tingle with the news of each succeeding morning, only because the faculty of horror has its limit, like every other human faculty. The conflagration of Paris by the Commune, the civil war, waged for no object intelligible to the ordinary mind, urged with a ferocity, and avenged with a cruelty that might have been expected among the slave-dealing tribes of Africa, are events without parallel in history,—unless it be sought in the madness of the elder reign of terror, or in the frenzy of the factions that tore asunder besieged Jerusalem.

With the slow toleration won for that armed truce which is called Provisional Government in France, the effect of that constantly-growing interdependence of the various nations of the world, which is the consequence of steam transit by land and by sea, became sensible in our own social condition. Different, and unexpected, phenomena appeared in this country, each of very significant nature. The flow of money to the support of enterprise, which, since the shock given to public credit in 1866, has never regained its normal course, was, for a short period, arrested by the fears of peace, even more rigidly than it had been confined by the fact of war. The enormous ransom which France had to furnish dazzled the judgment even of the most astute financiers, by its unprecedented magnitude. People came to the extraordinary conclusion that, somehow or other, Germany would not be paid without the cellars of the Bank of England being emptied by the process. The increasing importance of the commercial and financial power of London in facilitating the monetary transactions of Europe was perhaps not overestimated. But the fact that the circulating medium could not be made to flow from its reservoirs contrary to the laws which regulate the gravitation of trade, was overlooked.

From unnecessary fear, the tone of the public passed rapidly to unbounded confidence, on witnessing what was called the success of the new French loan. The eager haste with which the population of a country bleeding at every pore rushed to inscribe their names as *rentiers*, when the Provisional Government had recourse to the mode, invented under the Empire, of borrowing at first hand from the public, instead of applying to them through the highly-paid agency of the great financiers, was a sign that produced anything but a feeling of security in the more reflective mind. With the annual expenditure of the State, to be drawn from a diminished territory, swollen to 50 per cent. more than the total budget of Great Britain—with the details and incidence of the requisite new taxation entirely unsettled,—with the main questions that affect national life, or, at all events, national welfare, postponed, because they were *trop brulantes* to be discussed except at the point of the dagger,—the eagerness of every one to secure a possible premium on these applications, or to draw an income from the State, no matter how raised—was not an omen of good promise for the future welfare of France.

The surge of the French storm—not the effect of the military collapse, but that of the occasion which it afforded for the triumphant activity of the enemies of every social tie, and of every object of human veneration,—spent its force on our more rugged shores. It is true that we heard much talk of the establishment of an international league of the producers against the chief consumers. It is true that an actual industrial revolution, in respect to the diminution of the ordinary hours of labour, is in course of accomplishment. But the unexpected occasion of the dangerous illness of the heir to the throne of Great Britain called forth such a sudden, universal, and long-sustained burst of loyal affection as few living Englishmen had witnessed, and as, perhaps, not one would have expected. While for the first time in the history of mankind consentaneous prayer has been offered in the four quarters of the world and in the sanctuaries of every creed, for the recovery of the same individual, the unconscious ejaculations from every rank and class in this country have displayed the depth and vitality of the roots which our time-honoured institutions have struck into our very hearts.

There is some reason to hope that the manner in which the public mind has been compelled, by the anxious desire to know all that can be known of such fearful scourges as enteric fevers, to give attention to the great subject of structural sanitary precaution, may not be without beneficent result. Meantime, slowly but surely, the principles of common sense in regard to this subject are filtrating into men's minds. Bit by bit reforms are attempted; and although we see as yet but insufficient promise of the systematic and general occupation of the profession of the civil engineer or the amply remunerative operations of sewage application, irrigation, drainage, water store and supply, and agricultural engineering, we are yet aware that the stone has been set rolling. The annual appeals of Mr. Mechi and his fellow-labourers, in respect of the latter, to the enlightened self-interest of the intelligent farmer are more effective than many persons imagine or than can be inferred from the newspapers. Hardly an eminence that commands any range of cultivated arable prospect can now be ascended without enabling the visitor to trace one or more steady tails of smoke or curling wreaths of silvery steam, defined on the sky or on the earth. These do not come from factory chimneys or from the stacks that denote the scene of the labours of the miner. They betray the presence of a sort of locomotion that is of comparatively recent origin, a locomotion as important as a minister to national wealth as its elder brethren whose pulsating breath moves at a speed of forty miles an hour along the landscape. The steam plough, the steam elevator, the steam thrashing-machine, the "drudging goblins duly set" to discharge the work, not of "the day-labourers" alone, but such as man and horse would occupy long and precious weeks in effecting, quietly and with little parade are being naturalised in our rural districts.

The architectural outcome of the year, if marked by less activity than the steady progress of commercial prosperity might have induced, and less advance than might be hoped for, is not without some noticeable features. In the metropolis we have had an important restoration carried out, in the Chapter-House of Westminster. The reverent care evinced by the Dean and Chapter for the protection of those priceless monuments of which they are the responsible guardians, and the skill and learning of the architect, Mr. Scott, have been happily combined. The result is the rescue of one of our most interesting national relics from neglect and decay.

The effort that has been made to raise funds for the decoration and ornamental completion of the Cathedral Church of St. Paul has been duly chronicled in our pages. Although the large sum asked for has not been forthcoming, a portion of the works contemplated has been undertaken. The character of some of the work done, and the indecision displayed, have not so far given that confidence to the public which is necessary if large sums are required from them. While speaking of St. Paul's, we may remember the attack made on Mr. Stevens, the sculptor, and not without some cause. It is to the honour of the profession of the sculptor, that no artist would stoop to take Mr. Stevens's work out of his hand. The arrangements ultimately made, with the efficient aid of Mr. Collman, are such as to give fair promise of the completion of this long-delayed monument.

Her Majesty the Queen in person, opened the new St. Thomas's Hospital, on the 21st of June. The situation of the building on the southern embankment, opposite to the Palace of Westminster, its unusual size, and the repetition of the same form in so many distinct blocks, make this edifice one of the most striking in the metropolis, though its details certainly admit of discussion.

London, during the past year, has also witnessed the opening of a building which, in the

magnitude of the audience for which it can find room, within reach of a single human view, under permanent roofing, is unrivalled in the world. Notwithstanding the many architectural defects of the Albert Hall, the loss of an opportunity, if proper deference to the experience of the best informed architects had been shown, of building a thoroughly satisfactory amphitheatre, and the difficulty still in course of investigation in the acoustics of the building, this noble room is a great acquisition to London. The rapid progress which is now being made in musical taste and education is such, that the oratorios and concerts given immediately on the opening of the hall attracted visitors in sufficient numbers to fill its ranges of seats. The Queen in person, accompanied by the Prince and Princess of Wales, and other members of the Royal House, gave sanction to the opening; and there could hardly have been an ear in the crowded assembly on which the remarkable melody of her Majesty's voice did not fall with the crispness of a silver trumpet.

Adjoining, or at least neighbouring, the Albert Hall, the new buildings for the Science Schools have reared their lofty structure, rivalled only as to height by the gables of the new courts of the museum itself. To these buildings, to the experiments made in their ornamentation, in *terra cotta* and in *sgraffito*, we have from time to time called the attention of our readers.

The New Law Courts, the Strand elevation of which we have engraved, appear to have been placed under the protection of Discord herself. Themis was, in the first instance, outraged, by a breach of faith with the architect entitled to the charge of the work. Then followed a stormy discussion as to the abandonment of the site. Questions of cost were raised. At the present moment, the foundations are settling themselves, while questions as to plan and elevation are yet fiercely debated. We have been forced to assert that the erection of the building next the Strand, as designed, would be a lasting discredit to the age and the architect. If no disposition be shown by the officials who have the work in hand to remedy the error, Parliament must be appealed to. The objection is much too serious to be condoned for the sake of personal feelings.

Railway communication has added another link to the metropolitan chain, by the pushing on the subterranean line from Westminster to Cannon-street. A threatened contest between the two companies which, for public reasons, ought to be one, was happily averted at the last moment; but the punctuality of service, which was a feature of the line up to a certain time, has now altogether disappeared. Parliament will be applied to in the ensuing session for powers to make the much-needed railway communication from Charing-cross to the lines running north of Oxford-street. A new central subterranean line is also projected; and there are more schemes than one for making the much-needed covered communication between the South Kensington Station and the Museum and Hall.

In London and its suburbs the returns from the first-opened tramways have been such as to stimulate public attention, and projects for what are in fact light railways, under another name, not only in different parts of this country but in Portugal and elsewhere abroad, have found, or at least have sought, subscribers. The public have heard less of the subject for the last few months than in the earlier part of the year; but it is one that is sure to come to the fore in 1872. The great railway companies meantime have at last allowed common sense to overweigh personal spite, or personal interest; and a series of amalgamations has commenced, which must lead to a very important revolution in the conduct of our internal traffic. The immediate result of this common utilisation of common interests, on the dividends for 1872, has been anticipated in the increased value of the stock of the amalgamating companies. Even independently of this, the steady improvement of railway traffic throughout the country has reached a point at which the original shareholders have begun to receive the full benefit of future profits. The interests of the public will call for protection.

The ancient abbey church dedicated to the proto-martyr of England began, early in the year, to threaten collapse, from the unsleeping action of the weight of its massive tower. But for the prompt measures taken, a few days, or even hours, might have witnessed the fall of a large portion of that venerable building. The evidence afforded in the examination of the structure of the manner in which the architects of more recent times hewed away the ancient piers and walls as though they had been living rock, is most remarkable. Our columns were freely open to aid the claims of the conservators of St. Alban's Abbey on the support of all who venerate ecclesiastical antiquity, and we gave a full description of a minster which presents a veritable museum of the historic development of English architecture.

The opening, on the 5th of August, of the new Indian Engineering College, at Cooper's Hill, had much more importance than that which attaches to the architectural features of the building. To the important question of the provision of a proper engineering staff for the wants of our great Indian empire we duly called the attention of our readers. The report on the professional education of the civil engineer in this country was a further contribution to our acquaintance with this important subject.

Among the most important architectural works completed in England during 1871, of which we have furnished to our readers elevations, plans, and other particulars, we may recall the church of St. Bridget, at Wavertree, Liverpool,—architect, Mr. E. A. Hefler (pp. 544-547); the Morgan Hospital, Dundee,—architects, Messrs. Peddie & Kinnear (pp. 317, 326-327); the new buildings for the Countess of Huntingdon's College, Cheshunt,—architects, Messrs. Lander & Bedells (pp. 667, 669); the Trent Bridge, Nottingham,—engineer, Mr. M. O. Tarbotton (pp. 857, 867); the completion of Elveden Hall, Suffolk, the mansion of his Highness the Maharanjah Dhuleep Singh,—architect, Mr. John Norton (pp. 904-907); the Foreign Mission College, Mill-hill, Middlesex,—architects, Messrs. Goldie & Child (pp. 964-966); and Bayham Abbey, near Tunbridge Wells,—architect, Mr. David Brandon (pp. 985-987). For illustrations of important works in course of execution, of current examples of street architecture, of colonial and foreign architectural works of magnitude, including the new opera-house of Paris, and specimens of some of the best works of the architects of Germany, we must refer to the index to our newly-completed volume.

Among the other features of the year which must not be passed in silence ranks the serious introduction of asphalte as a roadway pavement in London, to the immense relief of the nerves, the increase of quiet, of cleanliness, and of facility of traffic. The question of comparative expense, yet unsettled, is of less importance. But the terrible conflagration of Chicago has suggested a doubt as to the mode in which a great fire in London,—a calamity which is far too much within the limit of possibility,—would be increased in its terrors by such roadways. We have had to call attention to improvements in stone-cutting machinery; and at this moment two inventions for this purpose require further illustration and experiment. One of these is a diamond-faced concentric drill, for the purpose of testing borings through rocks; and the other being the application of fine silex or corundum, impelled by a violent blast, with a result that is described as perfectly magical. Here also we may repeat our reference to a machine, exhibited at the International Exhibition at South Kensington, designed to obtain motive power from the rise and fall of the tide,—a source of enormous dynamical agency, the ultimate application of which we have some time since pointed out as a probable result of the mechanical progress of the future.

Finally, among the characteristics of the year, we must note the new phase which International Exhibitions promise, or threaten, to assume. A display of this nature is now being organised to take place at Vienna, some sixteen months hence. While this scheme is, to our mind, too vast, and likely to some extent to collapse from its own weight, the orderly and systematic classification already indicated is such as to lead us to blush for the heterogeneous, rule-of-thumb character of our own attempts at programmes or at catalogues. Of the very interesting progress of Russia, especially of the building arts in that empire, and its international competition with other nations, we have been almost singular in giving any detailed account. The attempt to render an extraordinary competition part of the regular annual routine, which has been made at South Kensington, has already raised a storm, of the more menace because it threatens to separate those who ought to be the advocates of the purely educational character of any quasi-national exhibitions from the practical, substantial, interests of trade. We have also to refer to the unprecedented manner in which the vivid public interest which we were among the first to direct to the important national question of the probable duration of our coal measures, has been stifled by a feeble report, drawn up with the half avowed purpose of making things pleasant, and to which we must refer at length hereafter.

A word may be permitted to recall the fact that, as one of our opening numbers gave a sketch of the history of the great railway contractor, Thomas Brassey, so does the closing one chronicle the death of the once famous railway king, George Hudson. The difference between railways in fact and railways on paper, between practical industry and speculation, is illustrated by the different close of the careers of these two remarkable men.

To resume:—the close of 1871 calls on the English nation for grateful hope. If the sky be not gilded with that rosy brilliancy that gives promise of a splendid morrow, yet at no corresponding period for many years has it been so free from even the smallest cloud indicative of storm, so far as our own country is concerned. At no time has there been such a golden opportunity for wise administrative improvement, for those social reforms which it is in the power of each parish and each district to effect. At no time has there been less excuse for diverting the attention of men from practical work to the attempting theoretic revolutionary change. Our work, at home, is immense. Public education has been rendered possible, and that is all. We must put our own shoulders to the wheel, or the ruts of routine and the stones of indifference will retard all useful effect. Above all, if we are only wise enough to devote some of the great accumulated profits of an unexampled trade to the systematic aid of agriculture by engineering, we may bring under cultivation immense tracts of at present useless land, and may be able to inaugurate for Old England a new and durable era of health, wealth, and happiness.

## THE STRENGTH OF PORTLAND CEMENT.*

About five years ago, Mr. Grant read a paper to the members of the Institution of Civil Engineers, informing them of the result of a series of experiments he had made to ascertain the strength of Portland cement. There were three lines of inquiry that he considered should be followed further. In the interval he has made a number of additional experiments in these directions, and in April he read an account of them and their results to the members of the same Institute.

This second paper is now published. We understand that the first point upon which Mr. Grant endeavoured to obtain further information was the strength of adhesion between bricks and cement, under varying circumstances; the second was on the limit of its increase of strength with age; the third, the relative strength of concrete made with various proportions of cement and ballast. He re-arranged these heads for his new experiments thus:—A. On the strength of Portland cement tested by tensile strain at different periods, from one day to twelve months. B. On the adhesion between bricks cemented with Portland cement and lime mortars, tested by tensile strain at the end of twelve months. C. On the strength of Portland cement bricks, neat, and with different proportions of sand, tested at the end of twelve months by compression in a hydraulic press. D. On concrete blocks of different proportions of Portland cement and lime, with gravel, sand, and other materials, tested at the end of twelve months by compression. Mr. Grant gives about 50 tables setting forth the various results of his different experiments. Builders about to use cement for constructional purposes will consult their own interest by studying these tables for themselves. It is sufficient for our purpose to give an outline of the experiments, and of their results. We referred to them recently in our remarks upon the effects of cement upon metals.† Though they do not throw new light upon this question, they afford, as will be seen, valuable information concerning the

* "Further Experiments on the Strength of Portland Cement." By John Grant, M. Inst. C.E. With an Abstract of the Discussion upon the Paper. Edited by James Forrest, Assoc. Inst. C.E., Secretary, by permission of the Council. Excerpt Minutes of Proceedings of the Institution of Civil Engineers. Vol. xxxii., session 1870-71., part ii. London: Printed by William Clowes & Sons. 1871.

† Vol. xxix., p. 807.

behaviour of cement in conjunction with brickwork.

Mr. Grant ordered about 40 bushels of Portland cement, weighing not less than 112 lb. per bushel, to be sifted through a sieve having twenty holes to the lineal inch. The bushel measure was to be filled from a hopper 2 ft. above its mouth; and each striked bushel was to be weighed. The whole quantity was then to be put together again, and turned over many times. With cement thus treated, which weighed 110·56 lb. per striked bushel, all the experiments were made. Equal weights of cement and water were to be used when a paste of neat cement was required. Forty bushels of clean sharp sand washed and dried completed the preparations. Equal weights of the sand and cement were also used. The first experiment tested the advantage of sifting the cement. Five moulds of sifted and five of unsifted cement were placed in water. The first, at the end of seven days, broke at 959·4 lb. = 427 lb. per square inch; the second at 842 lb. = 375 lb. per square inch; showing a gain of about 14 per cent. by sifting. Another prominent fact brought out in the course of the further experiments, is that concrete made of broken stone or broken pottery is stronger than that made with gravel. A third is the necessity of soaking all absorbent bricks in water before cementing them together to prevent them from withdrawing from the mortar the moisture required for its crystallisation.

It was ascertained by the experiments made in the first branch of inquiry that mortar mixed by hand is stronger than that ground in a mill. "The maximum strength of that mixed by hand," says Mr. Grant, "seems to have been attained at five months, and that ground in a mortar-mill at one month, the greatest strength of the former being nearly double that of the latter." That which was ground by hand maintained its strength, while that which was ground in the mill declined, owing, he thinks, partly to the interruption of crystallisation by the grinding, and partly to the destruction of the angularity of the particles. In the second line of inquiry it was ascertained that the more absorbent bricks, provided they have been thoroughly soaked, adhere better than the non-absorbent. The third series of experiments shows that the denser Portland cement bricks are the greater is their strength. Bricks made of neat cement bore a pressure equal to that borne by Staffordshire blue bricks, or by the best Wareham red bricks. The fourth line of inquiry showed that concrete cubes that are made of the largest proportion of cement to ballast are the strongest, and that compressed blocks are stronger than uncompressed blocks.

The Albert, or southern embankment of the Thames is the field chiefly quoted by Mr. Grant as the site of his observations. He gives a plate showing the manner in which Portland cement is used in the sewers of the main drainage, sometimes as a foundation or backing for brickwork, and sometimes for the formation of sewers by itself. A concrete sewer costs half the price of one made of brickwork, unless it is rendered inside with cement, when it rises to about the same expense as when lined with half brick. Upwards of 5,000 ft. of sewers in this part of the Metropolitan drainage have been made of concrete, lined with half-brick; and upwards of 6,000 ft. constructed entirely of concrete. And Mr. Grant urges that not only sewers and culverts of any size might be advantageously made with the material that he has taken so much pains to perfect, but docks, piers, breakwaters, roads, and dwellings, and even great aqueducts through the sandy districts of Africa.

In the discussion which took place among the engineers present at the reading of the paper, Lieut.-Col. Scott pointed out a danger of expansion in Portland cement when too much chalk is used in its preparation; and related that he found on examining some cases of cement in which great strength had been aimed at, and the clay reduced from 22 or 23 per cent. to 18 or 19 per cent., that extraordinary expansion had occurred. He considered a new mode of using lime adopted at South Kensington preferable, and described his method of making mortar there, by which grey lime yielded more strength with six parts of sand than Portland cement with four parts of sand.

Mr. Latham pointed out another danger from the presence of chalk in cement. The ammonia contained in sewage changed its character when brought into contact with lime. It was converted into nitrous and nitric acid, which formed nitrates and nitrites, so soluble as to be washed out either by the sewage or by the infiltration of subsoil waters, leaving nothing but sand in the joints. Under these circumstances, sewers fell in, and found that every particle of lime or cement had disappeared from the joints. He therefore proposed that tests should be made to ascertain the powers of resistance to nitric acid in different materials. There was a danger in carrying the manufacture of Portland cement to a point where the quantity of chalk in it would render it unable to resist the chemical action of the matters brought in contact with it.

The practical bearing of Mr. Grant's efforts to obtain a high strength in cement will be best seen when any great engineering operation is undertaken, such as the irrigation of the interior of Africa by canals, when it will be desirable to send cement in a concentrated form to the distant site of operations, to be there mixed with sand. The smaller the bulk of the cement, the less would be the cost of freight.

## THE WORKSHIFTS AND WORKSHOPS OF THE POOR.

A WALK through the ever poverty-stricken localities of East London, extending from the heart of Shoreditch, embracing Bethnal-green, and including portions of Whitechapel, reveals such sights of nature and human nature, and affords such impressions of the inner working life of the skilled and unskilled poor, as can never be effaced from the memory. True as when it was first uttered, and as applicable to-day as ever, is that pregnant truth, "One-half of the world does not know how the other half lives." Without a touch of the cynic, we might add, "nor does it care to know." Men and women among the humbler classes must of necessity work to live; and, failing to obtain work, have either to run the risk of entering the workhouse, drifting in amongst the dangerous classes, or of starving on sufferance in some wretched lodging. There is a very large class of workpeople,—men, women, and children,—who obtain their living in the east of London by making various small articles for domestic or public use. This class of persons are, in fact, small manufacturers, and they work for other small manufacturers of a different description, who can bring to the development of their business the application of a little capital. When entirely without orders, these poor manufacturers, if they can scrape together by hook or by crook a little money, by borrowing or selling some household possessions, commence the making of a little stock of articles on "spec," i.e., on chance that they may be able to dispose of them at remunerative prices; or, if failing that, to get the first cost back. Christmas time, though it may be productive of many orders to some classes of trade in which the poor are employed, brings on the cessation of a great many more little dreamt of by the majority of the well-to-do members of society. The class of the working poor that form the subject of our notice are to be found in rooms, cellars, attics, and small improvised wooden sheds, or so-called workshops in backyards, working under conditions that cannot be contemplated without melancholy, for in their struggle for life disease is running a hard race with them, and there is little doubt who will be the worsted party.

In our visits to the haunts and workshops of the poor in the localities named all were found absorbed with thoughts on Christmas and the preparation of work that would enable them to tide over their difficulties to the New Year. In wretched and darksome cellars under the footways of some back streets, the broken-down joiner and cabinet-maker was found making some article or other of household furniture, for sale; in some cases it was for a public stall in the street, such as Brick-lane; in other cases the daughter was to hawk it through the streets from door to door. A clothes-horse, a kitchen form, a child's chair, a salt-box, a small step-ladder, a knife-board, a rubber roller, a hall or bedroom rack for hats or coats, window rollers, or a wooden coal-scuttle,—these were among the divers articles we found in course of manufacture by the poor broken-down mechanics and the "handy men" who could find no other means of employment, and who were unfitted otherwise from many causes for obtaining work in the ordinary workshops of the City.

Their stories of the past and the narrative of their struggles would be a tedious recital. In other branches of skilled or handy labour of a fallen and impoverished kind we found the brazier and tin-plate worker, the wire-worker, and the smith's helper or strike hand, busy in forging or forming some little article of tin-plate, wire, or iron for street-stall sale, or on an order from some humble room-keeper. Among these articles were gridirons, toasting-forks, flower-stands, culinary requisites, tin tea-pots, and trenchers; and various children's toys, and baby tea-services, rattles, money-boxes,—in fact, the articles in the baby amusement line were innumerable. Among the women and girl workers in many a dark room we found the struggle for life to consist in making various paper patterns for children's clothes, ornamental paper flowers, a device for Christmas decoration, knitted and crochet work, anti-macassars for backs of sofas and chairs, little d'oyleys and mats for placing under lamps and trays, hearth-rugs, hassocks, pincushions, sandbags for windows, mittens, cuffs, and a legion of similar things. In other homes we found family groups engaged in colouring pictures and prints, or executing ornamental letter-writing and figures for shop display, and like work.

Among the latter class there were some who were working to order, as were a few whom we found as busy as the proverbial nailers, in manufacturing pill-boxes for the chemists, band-boxes for hatters and millinery establishments. Brace-makers and strap-makers, and makers of other articles in web and leather work, we found in the vicinity of the former class. The poverty-pinched looks, and the desolate homes and surroundings of these latter classes, were mournful to contemplate, and the thought of the pittance they were in the habit of earning gives rise to painful feelings.

In the vicinity of Spitalfields, and in that street of ill omen, Flower-and-Dean-street, Fashion-street, and the courts about, a little industry was found by us making spasmodic struggles for life and living. A few fancy comb-makers were struggling with the aid of their wives and children in preparing what they called tortoise-shell specimens for sale. Some of the patterns were very beautiful, but we have a doubt that they were what was represented. When the combs were slit and serrated, the work of polishing and finishing fell to the hands of the junior members of the family. In one instance, a little girl of twelve was the deputed saleswoman, whose business was to trudge into the heart of the City, and effect a sale of those tortoise-shell articles of the toilet by calling at the different commercial chambers and offices, and soliciting the young gentlemen, clerks, and others to purchase. The poor father at the bench at home in his miserable lodgings was but a skeleton in rags, and wretchedness was the sum total of the possession of the household. A few of the antique weavers in the Spitalfields quarter were busy over woof and web of silk and satin, or more plebeian stuffs, but the weavers in general in the district are steeped in the lowest dregs of poverty, and the race is nearly decimated.

The ill-ventilated and dust-covered rooms of the majority of the weaver class are heavy and suffocating to remain within for any length of time. The miserable creaking and antiquated old machines whose frail shuttles must have been flung upwards of a half century ago, are in many cases only fit for firewood; yet, deprived of these looms, the weaver and his wife might at once enter the workhouse. The bread that is earned by them is only sufficient to keep life and soul together. Some of those who had not an order to execute were making a pattern for chance sale, or in view that Mr. So-and-So would take it off their hands.

While down in these wretched localities, where extreme indigence always reigns, we heard of others who were making their extraordinary workshifts for Christmas. Several men of the working and labouring classes, out of employment, had gone on a march down into Essex, for a supply of holly and ivy, mistletoe, and other evergreens, for street sale. The usual coster class, with their donkeys and barrows, were in the trade, too, and were gone in search of cheap suburban purchases from gentlemen's gardeners and land stewards. The large markets of the City do not supply more than a definite quantity of the evergreen shrubs for Christmas decorations for shops, churches, and the houses of the people. Small farmers' carts and wagons bring into London from all quarters large quantities of these Christmas

decorations, independently of those who make it a speciality. This, however, is a branch of industry that any of the poor may take to who are anxious to earn an honest shilling, and obtain a Christmas dinner for their family, independently of the out-door relief of the district workhouse.

The work-shifts of the honestly-inclined poor out of employment are innumerable and many-phased. We came across instances, in our East-end tour, of most respectable families, whose means were so straitened through various mishaps as to oblige them to enlist the whole services of their female family circle (mother and daughters) to prepare articles of wearing apparel, millinery, embroidery, crochet, lace blinds, curtains, ornamental work, and so on, to help them through this festival time of the year. Let it be known to all who read our words, that there are thousands of sick and indigent, honest room-keepers, who are living in a state of semi-starvation, who will not ask for relief, and, if asking, would not, perhaps, obtain it on account of their genteel poverty. These people would labour in many instances at work they know how to do, but they are ignorant how to look for it, or are unable to fight the rough battle of competition for work outside doors with hundreds of others. They are, in truth, to be pitied, particularly the delicate females amongst them.

The professional thieves, cadgers, and impostors who are so numerous in the eastern districts of London, are even impelled to perform some species of labour about Christmas time, — not from their love of honest labour, but from the facility that exists in certain channels for improving the occasion by a ready and profitable stroke of business. The extra lazy, hulking fellows of the world of labour who will only work from sheer necessity, and who drink and smoke half of their time away, while allowing their unfortunate wives and children to starve and labour for them, are now to be found doing "handy jobs," such as cleaning windows, whitewashing rooms and kitchens, going errands, helping salesmen and brokers, in loading or removals, or "lending a hand" to anybody who can trust them to perform anything right. There are hundreds, however, of builders' labourers and other general labourers who are glad to earn a shilling about Christmas time, and who *are* worth their salt.

The case of the London Dock hands is truly pitiable: they are not half employed, nor are they more than half paid for their labour when they have it to perform. The weary, anxious watching and waiting for a call at the dock-gates is a most killing and crucifying suspense,—a dismal vigil in cold, hunger, and dirt. Let those who may enjoy and can enjoy a happy and merry Christmas-time, think on the deplorable condition of the London poor.

Want and suffering are pressing down thousands of our fellow-creatures, honest and dishonest. Deadly disease has taken hold of them indiscriminately, and they are falling, falling to earth by the force of combined evils, which are preventible. The well-inclined poor make many efforts to help themselves, not alone at stated times like this, but throughout the year; but they are overwhelmed by an ocean of seething misery. Not to-day or yesterday are the things that we have witnessed new to us. Alas! no. These are chronic pictures of city back life and desolation, which have been again and again encountered and described. The homes and workshifts of the industrious poor of this metropolis present pictures of life that can never be faithfully portrayed. They must be seen to be known, and almost realised in person before painted, because they exceed the bounds of all ordinary belief.

What are wanted for the present are personal examination, sympathetic advice, and assistance; and, for the future, the most earnest consideration as to the means that should be adopted to alter such a monstrous state of things as now exists.

## SCANDINAVIA, AND ITS ARTISTIC AND NATURAL CAPABILITIES.

In the present state of things architectural and artistic, it is not a little interesting and even important to give a little thought from time to time to what is going on, not only in this realm of England but also on the Continent. There is of course a general sort of progress, as it is called, being made everywhere: we are not certainly in the same condition or way of living as were our ancestors of the Middle Ages. Yet are there out-of-the-way spots on the surface of Europe, wherein may be found a state of things belonging to the past not only in form but in spirit, and to be appreciated only by those who are willing to look into that Past, and to compare it with the Present. Not a little of the theology and politics, as well as of the ways and modes of living, and of social life and art, and what is mere system of art action, will be found to prevail in some portions of Europe which belong entirely to the past, and which are indeed the remains of it and come directly from it. Let us dwell for a moment or two on these strange things, and on their significance. Nature, too, in some out-of-the-way places still holds her own, and seems to defy the ingenuity and the mechanical skill of man; she holds her own, and cannot, or at any rate has not yet been, conquered. Thus may the history of Europe be divided into three epochs and divisions answering in some sort to them, *i.e.*, there are parts of Europe wherein things are in precisely the same state as before the advent of man into them. Art there is none, for man has been able to do nothing. Next there are spots, happily for artists, architects, and painters, wherein the past is present, and where the modern man, with his system of art-manufacture and machine-work, has as yet made no visible impression. We see in them the hand and brain-work of our forefathers. In such places is found the real art of Europe,—rude it may be, but still good and true of its kind. In other places,—the great majority of places, indeed, in the modern world, —*all is new*, and is to-day a partial revival and copying of the past, though not its reproduction, as is sometimes supposed. The true expression of nature is blotted out,—the very improvement itself does it, so that nowadays there come into existence daily spots wherein there is neither fine art nor the nature out of which it grows. This is, it must be confessed, a somewhat novel way of subdividing the world, but if by it any light can be thrown on things, some little good,—at any rate, novelty of information,—may come out of it.

No sort of doubt, of course, exists as to the fact of the doings and existence of the modern world; neither can there be of the existence of the remains of the past, such as the Middle Ages have left us; but there may be a doubt, and more than a doubt, in some minds as to the reality of a primeval state of things in modernised Europe. But such is the fact, and it is so curious, artistically looked at, that we may perhaps be even thanked for calling a little attention to it.

The city of Christiana, the capital of Norway, is almost wholly modernised; indeed, it is needless to say that the all-pervading influence of Paris has ruled, and does rule, its social and fashionable existence. It was founded in 1624, and is for the most part of the regular straight street build. It is rapidly growing, and contains, as the guide-book tells us, a "goodly many new and pretty buildings, private as well as public." The king's palace, the Parliament-house, and the university are at the west end,—there seems a sort of magic in the west end of the town,—and, of course, congregated round them are the residences of the Lothairs of the northern city. We need hardly say that there are a multitude of churches, and that more are to be built. We might say something of the streets of this somewhat out-of-the-way city, so well "pavemented," as the quaint guide says, and in the night "lightened with gas," but our object is to tell of the strange "*surroundings*" of the place, and the artistic doings of the common sort of people, not yet under the influence of French fashions and ways of living. Christiana lies in a valley, and close to the sea on the shores of the Bundje Fijord, and for some few miles round it to the north, east, and west the ground is cleared and cultivated; but immediately to the north of the city, and at the distance of a few miles, there begins a *primeval* forest,—not, be it observed, a park, or what is here called a forest, such as that at Windsor or the New Forest, but the untouched work of Nature, an impenetrable barrier of great trees and underwood, so thickly grown together that to pass through it is impossible: so much so, that the great Baron who owns one vast estate some thirty miles in length, has never seen his own land. In this strange place there are lakes and watercourses worth the painting, *improvement* not having yet set in. It is not a little singular to find the two most opposite of the things of this world so close together, and within sight of each other,—nature as it existed and looked thousands of years or ages ago, and modern fashionable life and ways, and building and art manufacture, as they are in Paris and London. It may be of some interest to note that this special bit of the earth's surface is the property under feudal tenure of the Baron Wedel Jarlsberg, who lords it over some twelve to fourteen thousand people. But a few of these people have farms leased to them; the great majority simply live and work, and know nothing,—perhaps happily for them,—of the nature of rent and the profound theories of political economists. It is a curious thing to find, as it were, *the middle ages in the present*, not only in form, but in pressure: it realises to us in no slight degree the state of things in this country during the times which gave birth to our cathedrals and churches, now so puzzling to us, and the full meaning of whose forms and method of construction are yet problems waiting to be solved. And here may we not ask, in the first place, and before speculating on the building of a cathedral, or a royal palace, or baron's castle, *how* the cottages or huts of the husbandmen came into existence? Little has been thought or said on this point; but it is in reality the key to the whole system of building and architecture; for houses of some sort were built to live in before churches. Here the huts of the tillers of the soil are built of the timber which grows nearest to the spot whereon the future house is to be built, and the method of construction is simply traditionally constructive, *i.e.*, the last cottage or hut is like the one before it, and in the same style, if that important word may be used as descriptive of such rude work. This, which at first sight may seem but of small importance, is in reality not a little explanatory of the way in which the old architectures were worked out; the old patterns suffered till some man hit on a new one, not by the copying of older "precedent," but by the growing up of new forms of construction and of fine art,—just, indeed, as change and new fashion in dress goes on or progresses, or the old ways die out.

And this brings us to a something beyond the mere construction, and directly into the regions of fine art and architecture. In this rough wooden style of building and construction there is no necessity for a thought about ornamental forms of any kind; yet will it be found that the natural instinct of man and his fondness for ornament and innate love of the pretty and *handsome*—to use a favourite modern word—is all over the wide world the same, for in and about the rude huts, consisting of but two rooms, a general living-room and a general bed-room, which serves, with the living room, for the whole family, there are constant little evidences of artistic feeling, and opportunities for the designing faculties. What are generally known as wood or timber mouldings would seem to be common all over the world, for a square beam of timber with the sharp corners cut off is an ornamental beam; and if the end of it, as in a wall-plate or ridge-beam, projects beyond the wall surface or roof covering, we are quite sure that some beauty or fitness is seen to lie in it, or it would not be done. It is curious to see what a very little serves to give an ornamental—nay, an architectural, character to a rude wooden hut. It seems to have almost grown out of the ground, like the trees of the great forest around it, and to harmonise with the rough uncultivated nature around it. A little cluster of these rude huts within the shadows of the great pines is a picture wherein no sort of *invention* is needed to cr e an interest in it. It is in harmony with itself. But in contrast with this simple way of doing things, the great Baronial Hall itself may be instanced. It is almost a new building in the pet style of important villa architecture; all is quite new and clean, and, artistically speaking, out of all harmony with the rough pine-forest scenery around and about it. A Norman keep might fraternise with the surroundings, but not this fashionable villa! It is pure modernism taking possession of pure nature, and it would, perhaps, be difficult to find anywhere else such a contrast. We may mention here, as a curious fact, that the whole of the city of Christiana is supplied with water, and pure water too, from the lakes and water-courses, so that there are no water companies to harden the water by passing it through patent filtering apparatuses. There is a constant service. All the wood for fuel is got from these forests in vast quantities, though no impression seems to be made on the thick and luxuriant growth of the trees which supply it. Nature here seems to be having a fair fight of it, for the timber grows as fast as it is cut. For practical and economical reasons, even for nought else,

should these forests be cared for and prized; but surely still more so for their unique character.

Nothing, therefore, as it seems to us, can be more singular, and better worth a little cogitation, than this existence side by side of the very modern of to-day and the very old—nay, primeval,—state of things. These impenetrable and vast forests of which we are speaking stretch northward to the very sea itself for hundreds of miles; and huge portions of them are as inaccessible as are the forests of South America at the foot of the Andes. Not a little curious is it to think of on that account merely, for, for thousands of years they must thus have existed; but the curious thing for the readers of the *Builder* is, the strange fact of this primordial state of things existing in immediate juxtaposition with that most modern and newest of things, a newly-built house, and street, and city after the ways of modern Paris and London. No one can possibly look at a modernised city such as Christiana, or at a villa such as the Baronial Hall, without feeling something like sorrow at the idea of the total extinction of the old Scandinavian spirit and ways of work. Why should the old individualities of Europe be extinguished? and what is the Frenchman, that he should have it in him to give to others what they can so well find for themselves? and what is that art or art-manufacture which the whole world seems so glad to take from Paris, and which it thinks so superior to anything which it can do itself, and out of its own individual power, and from its own historic memories? Out of the town, and in the "fresh and beautiful land" to the north of it, is Stubal Castle, built a "long, long time ago;" but the owner of it has determined to "lay down his castle, as of no use;" "but," says the guide-book, "when you see the old castle, you will be a little sorry when you hear it is to be put down." You will indeed; for it shows how completely "*progress*" is putting down individuality, even in the cold of Scandinavia!

## PENRITH CASTLE.

PENRITH CASTLE stands upon a slight elevation of old red sandstone gravel, about a furlong from the church and the old town of Penrith, and a few yards east of the modern railway station. Originally and always a simple structure of no particular military strength or architectural merit, its remains are now scanty, and chiefly remarkable for the excellence of their material and workmanship, and well known from their position in full view of one of the great highways of the country.

The castle is in plan a square, or nearly so, of about 125 ft. each way. It is composed of a stout and lofty curtain-wall, within and against which were built the rooms occupied by the garrison, and outside is an artificial and dry ditch, also rectangular in outline, and rather peculiar in the space left between it and the castle wall. On the west side this ditch has been removed in the formation of a deep road leading from the town to the station. On the south it remains, and beyond it are some excavations, which appear to be old, but are not very intelligable. On the east side the ditch is very perfect. About five yards intervene between its scarp and the foot of the curtain wall; and beyond, crowning the counterscarp, is rather a high bank, advantageously placed for those who intended to attack the wall with the weapons and engines of the Middle Ages. On the north front is a considerable platform, about half the area of the castle, and on the same level. This is defended towards the town by a natural slope, made somewhat steeper by art, but the ditch is continued in the rear of this, round the north-east angle, just west of which is a roadway, indicating the approach to the place. This approach was flanked by the north-east angle of the platform, and the ground beyond the ditch.

The earthworks on this quarter are so sharp and fresh, that they seem to have been deepened and strengthened to resist a modern attack from this quarter; and in that case the bank outside the east ditch may have been thrown up to protect the base of the curtain from being breached by cannon. Possibly the intention was to resist the Pretender's army in 1745.

The curtain, of which the ditch is the outwork, is about 30 ft. high and 5 ft. thick. It is built of blocks of the red sandstone of the district, of a deep colour, and grand appearance. These are squared, and laid in courses. The wall appears, wholly or in part, to have been crowned by a corbel-table, of moderate projection, upon which rested the parapets. At some special points these corbels are bolder, and form machicolations, but more commonly their object was to add 6 in. in breadth to the rampart walk.

Along the east, and on the adjacent part of the north and south sides, the curtain is tolerably perfect. On the west side are some foundations, and a fragment of wall, of full height. At the south-east angle a square buttress, original, of about 3 ft. broad by 3 ft. 6 in. projection, is set diagonally, and caps the angle. In the middle of the east wall is a similar buttress, but set square. These have no bases or sets-off, and rise to the parapets. At the north-east angle seems to have been a bartizan, or square turret, projected upon corbels above; but the wall is quite plain below. The other two angles are gone; but the foundations show no trace of mural towers. Grose's plan (i. 46), though very incorrect, may be taken to show that late in the last century the walls were tolerably perfect; and that in the centre of the south wall, and at the south-west angle, were buttresses similar to those described above.

All traces of the gateway are gone; but the earthwork shows it to have been on the north front, rather near the east end. West of this some traces of windows seem to indicate the site of the hall, and part of a large half-round barrel-vault, abutting against the remains of the west wall, seems to have belonged to its substructure. In the east wall, near its summit, are two large window-openings, about 5 ft. broad. The tracery is gone; but the arch of the recesses is flat segmental, strengthened by two plain bold ribs.

There is no trace of any keep or detached central building. The head of a flat-topped window of two lights, trefoiled, has been dug up and preserved. It seems to be Early Perpendicular. The general plan of the building and what remains of its vault and arches, seem to point to the Decorated period, during which both the round-headed and the flat segmental arch were largely used in this district. What remains seems of one date.

It has been suggested from the rectangular plan of the earthworks, and from the prevalence of Roman remains in the district, that the castle occupies the site of a Roman encampment, and that its material, said to have been taken from Mayburgh, was derived from some Roman building. This suggestion is, no doubt, perfectly possible. Certainly the material was not taken from Mayburgh, which never could have supplied ashlar in large quantities.

It is certain that there was no castle here during the early Norman times, or while the manor was the heritage of the kings of Scotland. From them it came to John Baliol, and was confiscated with his other English possessions late in the thirteenth century. The Neviles of Raby then held it, and probably built the castle. Richard Duke of Gloucester had the castle and manor, and seems to have been often here. He probably made any pure Perpendicular additions of which evidence may remain.

G. T. C.

## ON THE PROGRESSIVE USE OF IRON IN BUILDING.*

SOME acquaintance with iron is coeval with the first written records of man. Homer speaks of well-wrought iron (supposing σιδηρος to be iron), and our version of the Scriptures mentions Tubal Cain as "an instructor of every artificer in brass and iron," and there is some evidence that pieces of ornamental ironwork were cast in the Middle Ages. Yet it is little more than a century ago (in 1755) that Smeaton first used large pieces of cast iron for constructing portions of mill and engine work, and twenty-seven years later pointed out that the prophecies of failure then made had not been fulfilled. Less than a century ago (in 1773) Mr. Pritchard, an architect of Shropshire, designed and subsequently carried into execution the celebrated cast-iron bridge at Colebrook Dale, and from that time the use of iron has crept onwards with a gradually-quickening pace, until it threatens to become the conqueror of its more ancient rivals, stone and brick. At first the great strength of cast iron to resist compression, its small bulk, the ease of multiplying forms from one pattern, and its incompressibility, made it rapidly replace internal piers of brick and stone, and even timber posts. In timber buildings columns and stanchions soon came to be of cast iron, and where large openings were required with heavy weights over them, the arch and buttress were superseded by cast-iron girders. In 1796 Wilson erected a cast-iron bridge, in Sunderland, of 240 ft. span; in 1818, Rennie erected Southwark Bridge of the same span, the most graceful bridge that ever spanned a stream. Wrought iron had been used for pendant bridges at a much earlier date. A chain suspension-bridge is said to have been built in China as early as the first century. In Thibet, iron suspension-bridges are said to have been in use at an early period, and it must not be forgotten that Scamozzi notices suspension-bridges in Europe in 1615; but it was not until 1819 that Captain Brown built the suspension-bridge over the Tweed of 432 ft. span, and subsequently Telford put up the Menai of 560 ft. span.

We must not forget that these achievements in iron have owed their possibility to the gradual increasing knowledge of nature—a knowledge that has been rapidly progressing since the revival of letters. This knowledge of the laws of nature has been mainly due to the labours of philosophers: to Newton, to Liebnitz, to the Bernouillis, to Euler, to d'Alembert, to Dr. Young, were mainly owing the capability to execute the great works that have just been mentioned. Ware—who is still one of the authorities, if not the principal authority on vaults—investigated some of the principles of suspension and other iron bridges during the time that Telford was designing the Menai Bridge, and close upon his heels followed Tredgold, who collated what was known, besides adding his own experiments and investigations, and although these were imperfect, the knowledge he so imparted was the main cause of a much greater extension in the use of iron. The railways that were then beginning to be formed caused a great demand for iron, and the clumsy wooden roofs were rapidly superseded by those of iron. Sir Charles Fox paid particular attention to this subject, and some iron roofs were put up that almost vied in slenderness with the spider's web, and in many cases were as frail. Iron ship-building was invented or perfected by Ditchburn; and the boiler-plates, of which the ship's skin was formed, were soon destined to give rise to another novel application, whose brilliant results are still astounding us. After the fall of the mill at Oldham, and of several trussed cast-iron railway bridges, Hodgkinson's investigations were made public, and the ultimate capabilities of cast-iron were made known. Almost simultaneously the difficulty of bridging for railway traffic the Menai Straits at 105 ft. above high-water mark, suggested to Robert Stephenson the idea of an iron chimney-pot on a gigantic scale, and by the aid of the mathematical skill of Hodgkinson, the shrewdness and practical ability of Fairbairn, with the assistance of the accomplished staff of young engineers, of whom these were the chiefs, a wrought-iron girder of 450 ft. span, and of not more than 25 ft. in height, took in its interior the heaviest locomotives, carrying with them long trains of loaded trucks. This happy couple, wrought and cast iron, having been wedded in perfect equality, the most astounding results were obtained. The Great Exhibition of 1851 was perhaps the most startling event in building of modern times, and most of us can recollect the prophecies of its failure and collapse; the cast-iron columns were derisively called rain-water pipes, and the trellis girders were said to be so palpably insufficient that the engineers were obliged to cast a "tub to the whale," and put in extra braces of lath to deceive the eye, and quell the alarm in the public mind. The railway roofs grew from the modest spans of 30 ft., 40 ft., or 60 ft., to 120 ft., to 200 ft., of which no more splendid examples can be cited than that of the station at Birmingham and that of Cannon-street, and even these have been exceeded, I believe, by the wrought-iron ribbed roof of the Midland Railway Station, 240 ft. in span; but these works only show a minute part of the progress of iron. Iron light-houses, iron piles, iron cylinders, and every variety of iron girder, bowstring and lattice, Warren and Bow, plate and box, are used to construct every variety of bridge for railways; corrugated iron, buckled plates, and arched plates are largely used for walls, floors, and roofs, and castings have, I believe, reached the enormous weight of 1,000 tons. In short, iron is invading every branch of mechanical and con-

* By Mr. G. Aitchison; a paper read at the recent general Conference of Architects, and now published in a general "Report of the Proceedings" (9, Conduit-street). The paper on "Fire-resisting Materials," which follows, is from the same collection. Our readers will find ample return for their money if they purchase the "Report" of the whole Proceedings.

structive manufacture, and fills up the space between the steam hammer and the steel pen.

While on this subject, it must not be forgotten that these triumphs of iron, which have been mainly instrumental in altering the face of Europe, and almost of the world, are due to Englishmen; they were the inventors of the steam-engine, the locomotive, the railway, iron ships, steam-boats, the steam hammer, and the cast and the wrought iron bridge. It may truly be said that for the last century, as far as physical success can go, we have been "first in the race that leads to glory's goal." We are, and ever have been, an unartistic race, but it is also an unartistic period of humanity; no new creations in art have appeared; but there is one step we can take, and that is to throw off tradition and emancipate our minds, for in art whatever is not new is not true, and we should at least give up our schoolboy exercises and cease to paraphrase some old dead style. Let us dare to think for ourselves, even if our efforts are unsuccessful; let our works be uglier than they are, only let them be original; and if we can make no progress, let us be plainly simple or simply plain. In iron we have a perfectly new material untrammelled by old shapes or fitted to old arts. This age is a sort of Midas; everything it touches seems to turn into iron; architects only eschew it and cover it from sight, or seem to apologise to themselves and the world for being obliged to use it when they would have used brick or stone, and yet it is being forced on us; iron sheds, iron houses, and iron churches meet us at every turning, hideous if you please. Our problems are like those of pure geometry: we have to make things beautiful under certain restrictions, and why should we not boldly face the problem and unite our efforts in overcoming the difficulties that surround its use, and instead of letting it be our master make it become our slave. Cast-iron will take any form required: in that respect there is nothing further to ask from it, and it has everything to ask from the designer; its only defect is that at present we cannot get the sharpness of bronze because it is too hard to chisel and file; its other defects are that it rusts, that it transmits heat very rapidly, and in damp weather condenses moisture. If one-half the time that is expended in copying the mouldings and ornaments of Mediæval works were bestowed on endeavouring to solve these problems, we should have done them long ago. I appeal to the Mediævalists amongst us. Are you not taking the very opposite course to that followed by the men you imitate? Did not they set tradition aside and use their brains to throw old materials into a new shape, to acquire all the arts by which the materials they had could be made their servants and be fashioned to their wants, to invent new forms and new effects? Let us try to imitate their splendid audacity in construction, their unrivalled skill in perspective effects, their knowledge of the composition of masses and picturesqueness of outline, and their brilliant inventiveness; and not set up imitations of their works as monuments of our own imbecility, nor seek to make fetters for the present generation of the works of the most daring innovators the world has seen. Is it to be supposed that if the great Mediæval architects had possessed the powers of casting and rolling iron that we possess, they would have shown their incapacity to use them because the Romans were unacquainted with their use? Was it by servilely copying the Roman forms and making their civilisation fit into the discarded Roman buildings that their splendid original buildings were produced? They were not soldier-crabs to fit themselves into the empty shells of others, and if we really wish to imitate them it is by adopting the old and new materials to our present wants and our present civilisation. If we want art we must study the works of the artist-nations. We must go to Greek, Arabic, and Italian works to learn how common forms are conventionalised and purified, for subtlety of proportion, grace of moulding, or amount and placing of ornament; but to create we must go only to ourselves, and not ignore the material or mental wants of this age, or else we shall be left further out from the tide of human progress than heralds, necromancers, astrologists, or professors of other defunct arts. A stray nobleman or millionaire may have a fancy for a real Mediæval building, with real vaults and real Mediæval furniture, or even a church may be required to be built for some mediævalized clergyman, wherein all the wants of a modern church may be defied; but the bulk of mankind cannot be forced to put up with things they do not want, because we may not have wit enough to go out of our Mediæval leading-strings. If an ordinary man wants a house with one upper floor made incombustible, would he allow us to vault and buttress it? No: if we cannot use an iron girder and a flat brick arch, the builder in the next street, or the engineer, can; and though taste is at a very low ebb, yet all cultivated people prefer grace, simplicity, and elegance, to the mechanical complexity of Gothic cusping, or the coarse burlesquing of nature in Gothic foliage.

As it may be considered that something should be said on the use of iron by architects, I think I may say that as far as iron has been used constructively, the modern English architect has done very little. He has used the material as the engineers have done, and often with their aid; he, or they for him, have used some iron stanchions, girders, and roofs. One service has been rendered by iron for architecture: it has enabled it in the nineteenth century to rival the megalithic structure of early ages; the stone lintels at the North-Western Railway Station in Euston-square being held up, I believe, by iron girders. There are, however, some exceptions. Mr. Sydney Smirke constructed his dome for the reading-room at the British Museum of iron ribs filled in with thin brickwork. Subsequently, Brill's swimming-baths at Brighton were, I believe, domed in the same way. Iron columns are now being largely employed to support stone lintels and arches of buildings; Mr. Hopper, in an insurance office in Fleet-street, used ornamental cast-iron girders; my father used cast-iron for ornamental glazed screens at the Union Bank of London; and I have used ornamental skeleton staircases in Mark-lane, having removable stone or slate treads to be replaced when worn down. Architects building in the same neighbourhood have followed my example. I think Mr. Edmeston used tiles for the filling in of an iron-ribbed lighthouse; and I am told that many novel applications of iron, both constructive and ornamental, have been used by French architects, notably at the Catholic Church in Leicester-square; at the Library of St. Géneviève, at Paris; at the Church of St. Augustine, on the Boulevard Malesherbes; and also in the new room of the Imperial Library. I fancy that if architects would devote themselves more to the use of iron, they would find there was a great charm in designing the skeleton of their buildings in this material, and there is a great saving in the space otherwise occupied by walls. Once protect iron from rust, and what novel and beautiful buildings might be constructed of an iron framework filled in with glazed tiles on both sides, with a space between. What charming ceilings might be made of ornamented iron ribs filled in with small domes of china or pottery! What spans of rib and panel vaulting! What domes filled in with thick glass in beautiful patterns! I trust that architects will devote more consideration to the capabilities of this material for constructive and artistic purposes.

## ON FIRE-RESISTING MATERIALS AND CONSTRUCTION WITH REFERENCE TO THE PROPOSED NEW BUILDING ACT NOW BEFORE THE HOUSE OF COMMONS.*

The term *fire-resisting materials* is new in a technical sense, as far as I know; the corresponding term in the present and previous Building Acts has been "incombustible" or "fireproof." The latter may be considered a misleading one, and particularly so, as we may concur in thinking with Professor Lewis, that there is no such thing as fireproof construction except brick arches on brick piers. But "fire-resisting" is very different, and I presume it is intended to mean such construction as will resist fire for some time, and may be for many purposes all that is requisite. The materials specified in the proposed new Building Act as fire-resisting materials are,—

1. Brickwork constructed of good bricks well burnt, hard, and sound, properly bonded, and solidly put together with good mortar, compounded of good lime or cement in proper proportions, with sharp sand or other material, to the satisfaction of the district surveyor.

2. Oak and teak or other hard timber used for beams or posts, or in combination with wrought-iron, such timber and such iron (if any) being protected by plastering in cement or other incombustible or non-conducting external coating.

3. Slate, tiles, brick, or terra-cotta, used for coverings or corbels.

4. Flagstones used for floors over arches, but not exposed on the underside and not supported at the ends only.

5. Concrete properly compounded used for filling in between joists of floors.

6. Granite and other stone suitable for building purposes, by reason of its solidity and durability.

One word as to these different materials. Firstly, it will have been noticed that cast-iron is not mentioned as a fire-resisting material, and that wrought-iron is only introduced in a very limited way; that is, in combination with timber, and to be protected by an external casing of non-conducting material. As to brickwork, we shall all agree that it is fire-resisting, and after the scientific opinion of Professor Lewis, you will think that oak, teak, and similar hard timber are practically fire-resisting for beams and posts. After the other carefully considered observations which we have heard, it will be agreed that stone is by no means fire-resisting. Professor Lewis has said that even granite is not fireproof: it may be sufficient as a fire-resisting material; but stone, particularly Yorkshire stone, is not fire-resisting. I have myself seen numerous instances of it, as well as of other laminated stones, becoming disintegrated and losing all strength through the action of heat. I think some other means of fire-resisting construction, not alluded to in the Act, might sometimes be advantageously used. A few years since I was asked to give evidence before a select Committee of the House of Commons on the Prevention of Fires, and I was asked if I could make any suggestion for fire-resisting construction, particularly with regard to houses where the ground-floors are used as shops and families occupy the floors above. Being thus called upon, I worked out an idea that had occurred to me, by merely making a slight addition to the ordinary construction. I proposed that under the joists galvanised iron wires, No. 11 B. W. gauge, should be fixed about 6 in. apart, with staples driven into the joists, a centreing of rough boarding to be supported under the joists just touching the wires. Concrete composed of coarse mortar well mixed with broken bricks and tiles (pieces not to exceed 1 cubic inch) to be well pressed down from the top, so as to rest on the rough centreing and imbed the wires, the concrete to be 2½ in. thick. When the concrete is sufficiently set the centreing to be removed and the ceiling floated and finished in the usual manner.

The additional cost of this construction, beyond the ordinary lath and plaster ceiling, was estimated in detail by a well-known London firm of builders at the sum of 1*l.* 15*s.* per square of 100 ft.; but I am of opinion that if the plan were largely adopted, the extra cost would be considerably less, and that for ordinary houses it would not exceed 7*l.* or 8*l.*, if used for one floor, that over the shop. The additional cost of ordinary pugging to floors would be about 13*s.* per square of 100 ft.

I would ask your attention to another mode of construction, which appeared to me as useful in the sense of fire-resisting for ordinary buildings. Many architects, particularly those resident in London, may have seen some of those large structures of combined dwellings erected during the last few years,—buildings of five, six, or seven floors in height. Some of these have been erected by a firm of builders (Messrs. Allen & Son, of Tabernacle-walk) upon a mode of construction which has been patented. Cement concrete is used as the principal material for the floors and roofs; also for lintels, the treads of stairs, and in other places where stone or iron is ordinarily used. The concrete is not solely depended upon for strength,—a framework of iron bars being introduced into the mass. I confess I do not quite understand the way in which these combined materials act; but I can inform you, from the inspection of many specimens, that an exceedingly strong construction is the result. The mode of proceeding is this:—The blocks for steps, lintels, &c., are made in moulds in which a framework of slight iron bars is first placed, according to the nature and intended use of the block; the concrete is then put in, and well rammed, and left to set. After the blocks are removed from the moulds they are left for at least a month to dry and season

* By Mr. C. Fowler.

before being used. Cast-iron moulds are preferred where the number of blocks of the same pattern warrant their use, otherwise the moulds are made of wood. The concrete is formed with one part of selected Portland cement to seven parts of coarse breeze, a little fine stuff being put in first to form a good face where required. This material seems to stand the action of the weather and the London atmosphere very well, indeed better than almost any stone. The specimen produced is part of one of the rough lintels used in place of wood; from the absence of shrinkage and the roughness of surface they form excellent ties to the work. I have also seen a girder made in the same manner. There were two plates, each 6 in. deep and ¼ in. thick, about 6 in. apart, which were held together by bolts. Such a girder might be supposed not to be able to carry any great weight, but it carried the wall for three stories of an ordinary dwelling-house, in addition to the floors: its bearing was 12 ft., and the whole bulk of the girder was about 1 ft. square; it was formed *in situ;* the iron plates went on to the bearing. The floors and roof are formed as follows: — The bearing is first reduced to 8 ft. or 10 ft. by light iron bearers. Light iron bars, generally from 2 in. to 2½ in. deep and ¼ in. thick, are then placed in the direction of the bearing at intervals of 2 ft., and in the opposite direction they are connected together by ¼ in. rods passing through holes punched in the bars. The whole framework is laid on the top of the girders, the ends being caulked on to slight T iron wall-plates, giving a good tie to the walls. Boarding is placed underneath, and cement concrete poured in, which completely imbeds the iron framework; in a few days the boarding is removed, and the whole construction forms a remarkably steady and solid floor. It is all of the same material, which is very cheap, as the breeze costs very little, and the quality used of Portland cement is only about 1*l.* per cwt.

## NORTHERN AND CENTRAL ITALY.

AT the meeting of the Architectural Association on the 15th of December a paper, as we have already mentioned, was read by Mr. H. L. Florence, being "Notes on the Architecture—Ecclesiastical, Civil, and Domestic—of Part of Italy;" "from where the little northern town of Como lies sheltered under the shadow of the Alpine hills, to those distant cities whence over the desolate mysterious Campagna looms the solitary dome marking the site of the Eternal City;" and in the matter of time,—"from the epoch (eleventh century) when the strong faith and new dogmas of Mediæval Christianity threw into the quiet of the old world the germs of progress, and energy was shown by the West in the formation of a style of architecture of its own based upon reason and thought," down to the fourteenth century. The writer in the course of his studies abroad, as the holder of the Soane Medallion, accumulated a considerable number of measured drawings, general views of buildings in outline, and water colours, and, of course, many photographs; and some of these, illustrating the subjects of the paper, were exhibited on the walls, and apparently well appreciated. The conclusions of the paper,—not being formed during a short holiday and after desultory consideration, but in the course of systematic study of the actual buildings concerned,—are of some interest.

Mr. Florence commenced by pointing out the conditions and influences which moulded the architecture of Italy north of Rome up to the thirteenth century; tracing the development of the form and many of the details of the Mediæval church from the earliest Romanesque buildings; from Ravenna, over the yet unbridged interval of time to the buildings of the island of Torcello (Church, A.D. 1,000); to San Miniato, Florence, commenced 1013, having clustered piers; then noticing the main features of the Pisan school—the cathedral, completed 1118; "the buildings not differing greatly in their interiors from the earlier Romanesque, yet having in many respects a tendency towards Mediæval forms."

Turning to the Lombardic school, "having well-marked characteristics and steadily progressing from the vigorous though rude examples at Pavia to the elegant churches at Verona," noting also specimens at Milan, Modena, Parma, Piacenza, &c., the churches of this time and district were found to contain vaulted roofs, incipient buttresses, clustered piers, open triforium galleries, also arcading surrounding the domes at the crossings, under the nave-roof, most frequently round the eastern apse and sometimes following the slope of the main gables,—one of the most beautiful features in Lombard work. Early forms of window tracery also begin to appear, and instead of the simple arched doorways of the earlier churches projecting porches often in two stories. "In Verona also are some of the earliest examples of coloured decoration, the courses being alternated, warm-coloured stone and red brick; coloured marble being also used in shafts, cills, voussoirs, bands, and strings, generally not in thin slabs, as in Venice, but in the solid block." Many of these features and the general forms made comparatively easy the further transitions afterwards made.

After describing specimens of the Pointed style at Assisi (commenced 1228), Vercelli (1219), Asti, &c., crossing the hills from Perugia to arrive at the sister cathedrals of Sienna (1243) and Orvieto (1290), he found there "the most characteristic specimens of early Italian Pointed architecture, both entirely completed and both untrammelled by foreign influence; marked, however, by strong horizontality in their composition, and notable for the amount of sculptural and other decoration lavished upon their façades, of great beauty and richness, though wanting in the dignity given to our northern cathedrals, by their western towers." In these and other Mediæval churches at Bologna, Florence, Verona, Venice, &c., are to be noticed certain, usual if not universal, divergencies from the northern art of the same period: thus, "while the northern races concentrated and counterpoised opposing forces on strong buttressed points, leaving but screen-walls traceried and glazed, fitted for the stained glass in which they delighted; by a complexity of parts and variety of projection creating mystery and strong light and shadow;—the Italians, on the contrary, cared little for such constructive methods, used as few piers as possible, walls thick enough to resist the thrust of vaults without buttresses, required but little light, their window openings being thus of simple form, rudely glazed, for these long, simple, solid walls glowed on the interior with frescoes and mosaics."

The following table illustrates the dimensions of two of the great churches, and the differing modulus in the width of the bay, as compared with a German and a French rival:—

| | Height of Nave. | Width of Nave. | Span of Pier Arches. | Diameter of Nave Piers. |
|---|---|---|---|---|
| Cathedral at Florence | 120 | 51 | 51 | 8 |
| St. Petronio, Bologna | 138 | 46 | 46 | 8 |
| Ulm | 129 | 44 | 16 | 8 |
| Amiens | 131 | 38 | 16 | 6·5 |

In the later Italian churches the triforium was absent; the clearstories had only small circular windows; the piers were generally of most simple forms; the vaulting quadripartite and highly domical; the prominent dome, a favourite feature here, though never adopted, or even essayed, by the northern architects. At Pisa, Pavia, Milan, Monza, Parma, Arezzo, Venice, Padua, Sienna, may be found examples of varying date, and still, after many changes and fortunes, the dome is the chief glory and unrivalled excellence of the Renaissance. The octagonal-storied dome such as that crowning the Certosa at Pavia, and that at Chiaravalle, near Milan, was also used in place of the northern spire, which was rarely successfully carried out in Italy. The porches, with wagon-vaults on lintels and detached pillars; the peculiar plate tracery and wheel-windows also, in idea or in details, belong specially to Italian art.

Passing from the Ecclesiastical to the Civil and Domestic Architecture, the writer noticed in detail some of the town-halls, —"the exact counterparts of the civic buildings now erecting in so many of our chief towns; that is to say, in their requirements, for we rarely in our own time find that repose and dignity which mark even the humblest of the Italian examples. . . . There are few places which more recall the Middle Ages than the mountain city of Central Italy, perched as an eagle's nest upon high rocks, whose crags and cliffs formed defences stronger than could be built by the hand of man, surmounted by many-towered and battlemented walls, whence the far-extending valleys could be surveyed. In those times each city was a fortress, and every man a citizen and a soldier. Above the clustered hamlet, the suburban monastery, the city walls, rose the tower of the Podesta's palace and the cathedral,—the power of the State and the Church. . . . . The palace of the Jurisconsults at Cremona was being restored when I was there last autumn. The lower arches, on being opened out, displayed a lower arch. The arches are shown built up in the sketch in Mr. Street's 'Brick and Marble Architecture,' by which this building is so well known." The towers, residences, terra-cotta and brick details, &c., were then treated of; and, in conclusion, Mr. Florence drew attention to what he considered a misapprehension of the Italian Mediæval work:—"It is not Gothic. I would suggest that no building wherein the round arch may be substituted throughout for the pointed, without in any way influencing its structural completeness, and progressive development of idea, can really belong to the true Gothic; it must possess those characteristics forming a distinct type; and instead of being a subdivision of the great Northern school, may rank as an individual style by itself; named Pointed Romanesque, it would complete the long chain of art history from the Roman to the Renaissance."

In the discussion which followed, several points were noticed, and the opinion expressed that, although some of the main lessons of true Gothic art were only imperfectly learnt, or were frequently forgotten, by the architects of the buildings in the Pointed style in Italy, the difference between their architecture and that of the Northern nations is not in kind. That the coupling of piers, the recessing of arches, the all-pervading principle of subordination, the subdivision of labour,—each part having a distinct clearly-understood office,—are to be found the true Gothic of Italy; that notwithstanding the failure to attain the unity of idea so completely realized in the most perfect works of France, England, and Germany, the same distinctive characteristics are to be seen; and that it is better, and is now becoming also more usual to call some of the twelfth-century architecture of Lombardy and elsewhere "Round-arched Gothic," than to attempt to class Sienna, Orvieto, and Florence cathedrals,—on account of special proportions and prominence of horizontal lines and minor details—with the architecture not yet leavened by Gothic principles that we have agreed to call Romanesque.

## A WORD TO THE OWNER OF WARWICK CASTLE.

A PROPOSITION has been made, and, indeed, is being acted on, that, as Warwick Castle has been open to the public for several generations, the ruined portions should be rebuilt by a national subscription. The feeling which prompted this is very agreeable and creditable; but we are bound to say we do not find ourselves able to advocate the step recommended. In lieu of this, we venture to suggest to Lord Warwick a method by which he could conveniently accomplish the desired restoration himself.

Algernon, Duke of Northumberland, succeeded to the dukedom in 1847, at the age of 55. After passing a few years in improving the estates and the buildings upon them for others, he, at the age of 60, conceived the project of building for himself. To this end, he commissioned three architects to design plans for enlarging, restoring, rebuilding, and beautifying the three principal seats on his estates. To Barry he gave *carte-blanche* for Northumberland House; to Burton, Sion House; to Salvin, Alnwick Castle (subsequently in conjunction with Canina). To each of these architects was assigned a fee of 500 guineas, with unlimited control as to the nature and extent and magnificence of the designs they were to prepare. After these designs were sent to the Duke, he elected to begin with Alnwick Castle. In 1854, at the age of 61, his Grace commenced this great work, and, setting aside a large portion of his income, carried it vigorously on for a period of ten years, thus spreading over that period the entire cost, which was over a quarter of a million of money. The Duke took such a lively interest in the works, and in everybody connected with them, that he sojourned frequently at the castle during their progress, and, while it was dismantled, made great personal sacrifices, by residing, with considerable discomfort, in small apartments in the *enceinte* of the building. The Duke lived to see his work completed; for in 1864, at the age of 71, he tested the powers of the new kitchen by giving a magnificent banquet to about 1,000 people, who had been employed upon it; and after enjoying the pos-

session of his completed scheme a few months, he died, in January, 1865, at the age of 72, leaving a name behind him as one of the great builders of his time.

At a very early stage of this great work the Duke showed his indifference to the amount of time they were to occupy on an occasion when the body of labourers employed, thought, from the extent of the works, they would do well to strike,—and strike they did at a certain dinner-hour. The fact having been reported to the Duke, his Grace instantly replied, "Strike! Oh, let them strike, I am in no hurry;" and the men, on hearing of this, resumed their work within two hours of the strike.

Here, then, is an example to Lord Warwick. Let him commission an architect well versed as to conservation of ancient remains, and as to construction, decoration, and literary and sanitary knowledge. Let him give the architect *carte-blanche* to prepare designs for what Warwick Castle ought to be, and estimates of the total cost. Let him then set aside annually a portion of his income, and proceed regularly and by degrees with the works. If they occupy ten, or twenty, or even fifty years, and Lord Warwick's son or grandson has to carry them on and complete them, he will thus have at least the satisfaction of retaining the castle in his family exclusively as their own.

## BUILDINGS FOR MUSIC.

Sir,—It is no doubt desirable that this subject should receive full consideration on all sides; but the letter of "G. M." in your last is an unfortunate instance of the mistakes which people fall into in theorising on this subject without a knowledge of music *as an art*. "G. M." thinks it important to consider what amount of time discords are allowed in proportion to concords, in order to see how echo will affect the music. He takes four bars from the music of four periods to illustrate this, which he thinks are "typical examples." Now, in the first place, to take isolated bits as these for such a purpose is about as reasonable as it would be to take two words out of Milton, and the same number out of Swift and Tennyson respectively, to illustrate the literary style of the seventeenth, eighteenth, and nineteenth centuries. His first example I have not opportunity of referring to at the moment of writing. In his second example, from Handel, he will probably be surprised to learn that the "strong discord between voice and instrument of 1½ second," which he imagines he has discovered, does not exist at all, as the two sounds were never intended to be heard together! The *recitative* being a species of composition quite independent of strict time, the last note of the voice part and the first of the two concluding chords of the accompaniment, being both accented notes, were in Handel's time generally written under each other on the accented part of the bar, merely for convenience or from fashion; but the two chords were never intended to be played till the singer had finished his part (G. M. may satisfy himself on this point at any performance of one of Handel's oratorios); and as to the passage being "typical," Handel and his contemporaries would have shuddered at the bare idea of such a discord so placed. The next example, from the "Creation," shows that "G. M." has not a notion of the very essential distinction between "fundamental" and "passing" discords. The discords between voice and accompaniment in this case, which, in performance, would last about one-eighth of a second or less, instead of one-quarter, as he imagines (I do not know where he gets his notion of the time from), are merely part of an ornamental "figure" for the violins, which in execution is passed so lightly and rapidly over as never to be felt by the ear as a discord, nor did the composer mean that it should. The same remark exactly applies to the other example of what he calls a "gross discord" in Rossini, which would never be felt as a discord in execution, and which, again, goes twice as fast as he imagines. He has been looking at the accidental discords on the surface, instead of the fundamental progressions of the harmony; but even in regard to these, the question of the sequence of discords and concords is nothing to the purpose, in regard to the effect of echo: the question is, what difference of time separates the successive changes of sound, no matter whether concords or discords? A piece of music may be written entirely in pure harmonies, and if played in a building with a great deal of echo, so as to prolong the first harmony while the second is being played, there will at once be a marked discord, even more marked, very likely, than with a composition containing mixed discords and concords. The fact is, the whole of "G. M.'s" musical remarks are, as any musician could have told him, sheer nonsense: and if acoustic theorists could only be got to believe that there is something in musical composition and execution which cannot be dissected by their mathematical formulæ, they would be saved from making rather an absurd figure sometimes in the eyes of musical readers.

As to the proposition for a concert-room of radiating chambers, so as to provide against an extensive and prolonged echo, it might be interesting to see the experiment tried, if any one had money to spend on it, but it is probable that the result would not be such as to repay the expense; and that with the echo the audience would lose some of the music also, and the general effect be muffled and deficient in brilliancy. Plans and schemes which look perfectly logical and practical on paper, may be dissipated at once by the test of a single musical performance. For the present, it appears to me that one important step is to check the tendency to build over-large concert-rooms, which increase twenty-fold the difficulties arising from echo, which are not necessary to realise the greatest beauties of music, and which, by increasing the class of "monster" performances, tend to foster in the public mind the idea that "the more noise, the more music;" an idea which the Americans seem inclined to carry to its last pitch of absurdity. Keep our concert-rooms to a reasonable size, and echo presents little practical difficulty, but if we are to be content with nothing less than "Albert Halls" for our concerts, then farewell to all real enjoyment of music!—at least of such music as exists at present. H. H. S.

## SOUTH-WEST LONDON SCIENCE AND ART CLASSES.

The annual distribution of prizes to the students of these classes took place recently at the Albert Working Men's Club, Knightsbridge. The classes are held at this Club, at the National Schools, King-street, Chelsea, and at the Working Men's Club, Flood-street, Chelsea. Colonel Hogg, M.P., chairman of the Metropolitan Board of Works, presided, and handed each successful student his prize, saying at the same time a few words of commendation and encouragement. In the course of his remarks the chairman expressed surprise that the classes were not more numerously attended, especially considering the high average success attained by the students, who had obtained several medals, and the inducements offered in the way of local prizes by the generosity of private persons. The fees were very small; the knowledge imparted was not only of the greatest importance, but very interesting also; and he could not imagine what more working men wanted. He strongly recommended the men present themselves to join the classes, and to induce others to do so. He wished to impress on them that they owed it alike to themselves, to their order, and to the country, to strive after self-improvement. No pleasure was equal to the pleasure of conscious improvement, and no knowledge so valued or valuable as that which had been gained by some slight sacrifice and trouble. Men who spent all their leisure in amusement and indolence would never rise above their own rank, nor be much respected in it. Nor, in his opinion, would they deserve anything better. He hoped to find next year the classes considerably enlarged; and if a certain number more joined, and honestly confronted the examinations at the end, he would have great pleasure in subscribing 5*l.* for prizes, as a spur to their exertions.

Addresses were also delivered by Captain Mercier and Dr. John Mill, who both very ably enforced the necessity of technical education for the English workman.

## A COUNTRY-HOUSE, BOWDON, CHESHIRE.

This house, built for Mr. Charles Johnson, occupies a good position overlooking the beautifully-foliaged park of Dunham, situated at Bowdon, a few miles distant from Manchester, and a favourite place of residence of the "merchant princes" of that city.

The accompanying plan will fully explain the general arrangement of the house.

The outside is faced with Burnley pier-points, the dressings being of Yorkshire stone. The whole of the building is cellared, that part under the dining-room being lighted by means of areas, lined with glazed white bricks, and appropriated to the purposes of a billiard-room. The vestibule and staircase are warmed by means of hot water circulating in pipes and coils, fresh air from the outside being made to pass over the latter in such a way as to become well warmed before passing into the rooms above. The ventilation of the house has been effected by means of glazed pipes, built up between smoke-flues, and all collected in the roof into one shaft, in which is fixed a gas-jet, to assist the draught, if required, in sluggish weather,—a system which the architects have found, they say, very effective.

The contract for the house and stabling was taken by Mr. Cardwell, of Altrincham, for 5,442*l.* The architects were Messrs. Horton & Bridgford, of Manchester. The grounds have been simply but effectively laid out by Mr. John Shaw, landscape gardener, of Bowdon.

REFERENCES.

A. Carriage-house.
B. Harness-room.
C. Loose Box.
D. Stable.
E. Stable-yard.
F. Yard.
G. W.C.
H. Dust.
I. W.C.
J. Coals.
K. Manure.
L. Cook's Pantry.
M. Kitchen, 18 ft. by 16 ft.
N. Scullery.
O. Butler's Pantry.
P. Glass-house.
Q. Stores.
R. Cloak-room.
S. Entrance.
T. Area.
U. Side-passage.
V. Safe.
W. Service-room.
X. Lavatory.
Y. W.C.
Z. Hall.
1. Breakfast-room, 17 ft. by 22 ft.
2. Drawing-room, 27 ft. 3 in. by 17 ft., exclusive of Bow.
3. Dining-room, 26 ft. by 18 ft.

## THE NEW REREDOS IN THE CHURCH OF ST. MARY REDCLIFF, BRISTOL.

For many years the easternmost arch on each side of the choir, opening to the eastern ambulatory, whence the lady-chapel was entered, was blocked up with masonry, with the view of strengthening that end of the church, which was then in a dangerous state. The ambulatory was thrown into the choir, the wall and windows above were covered up with three large pictures by Hogarth, and an external approach to the lady-chapel from the east end of the south aisle was formed. This part of the church having been made more secure, the masonry in the arches was removed, and the ambulatory was reformed by the restoration of the stone screen of the lady-chapel on one side, and the erection of a rough temporary wooden screen next the chancel on the other. The chancel remained in this indecorous condition for a long time, the general repairs of the fabric requiring all the available funds. By the exertions, however, of the vicar and the churchwardens, a separate subscription was raised, and a reredos, from the designs of Mr. George Godwin, of which we now give a view, has been erected.* The side screens have also been restored; the chancel has been paved with encaustic tiles and marble by Messrs. Simpson & Sons; and such other works have been done as were necessary to fit the place for its purpose.

The reredos is of Caen stone, with the exception of four small shafts of red marble, and a small Greek cross and circle of mosaic work by Salviati, in the central gablet, and it has been admirably executed by Mr. William Rice, and the men engaged under him at the church. The capitals of the small columns, and the ornamentation round the arches, are all studied from natural flowers and foliage.

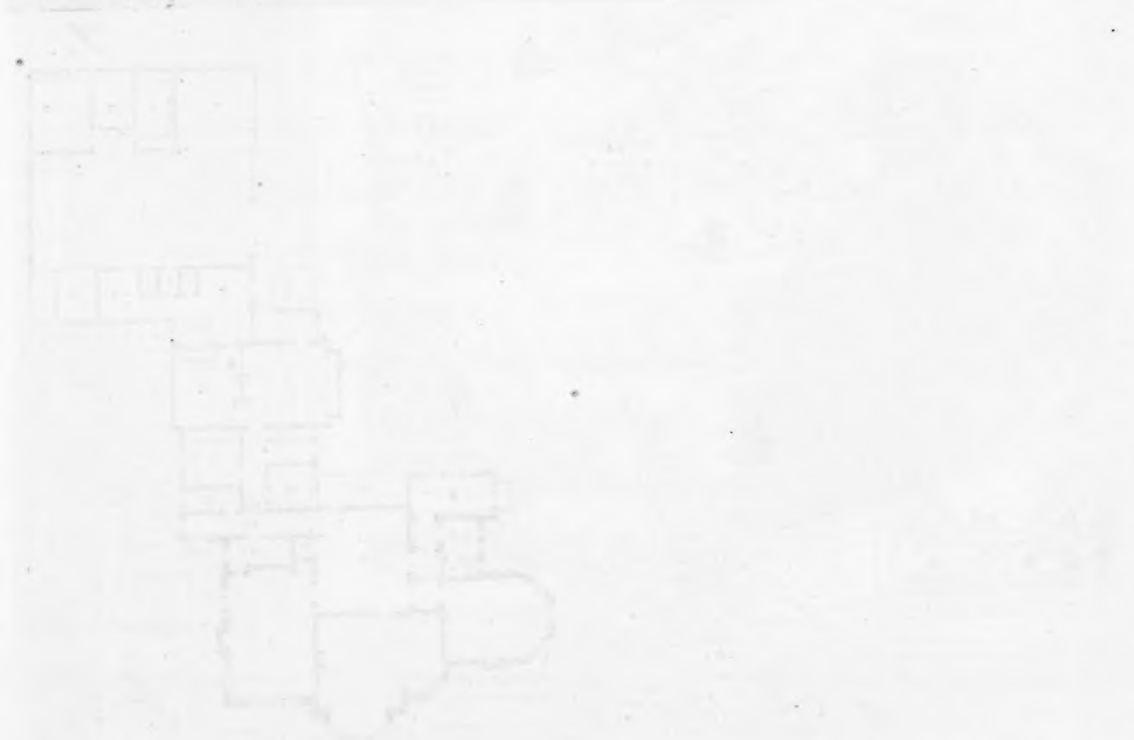
The reliefs in the panels, representing the miracle of the loaves and fishes, were executed by Mr. Forsyth, of London, and are very creditable to him.

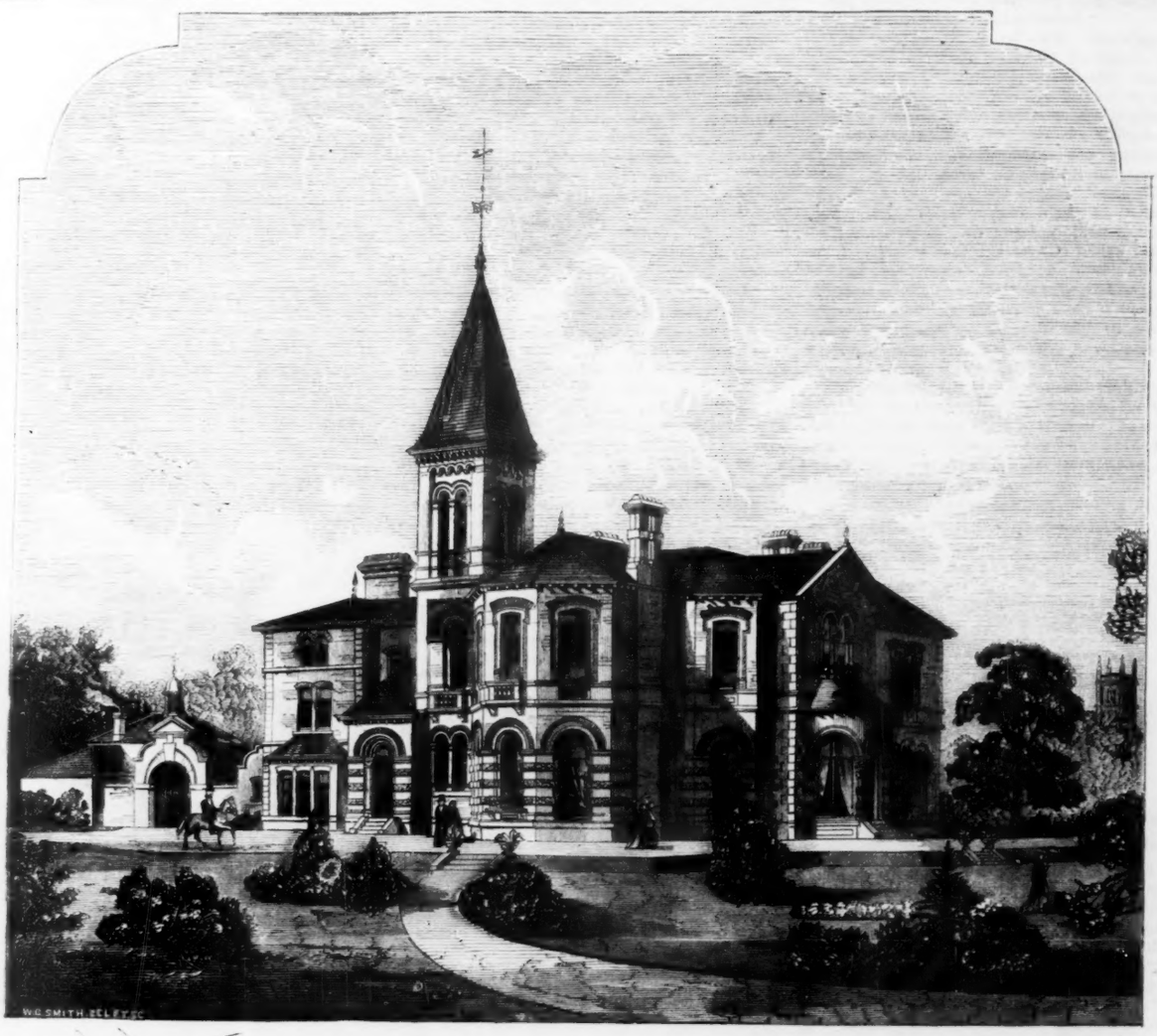
The altar-table is of oak, of simple design, the top being formed out of a marble slab, formerly used in the same position.

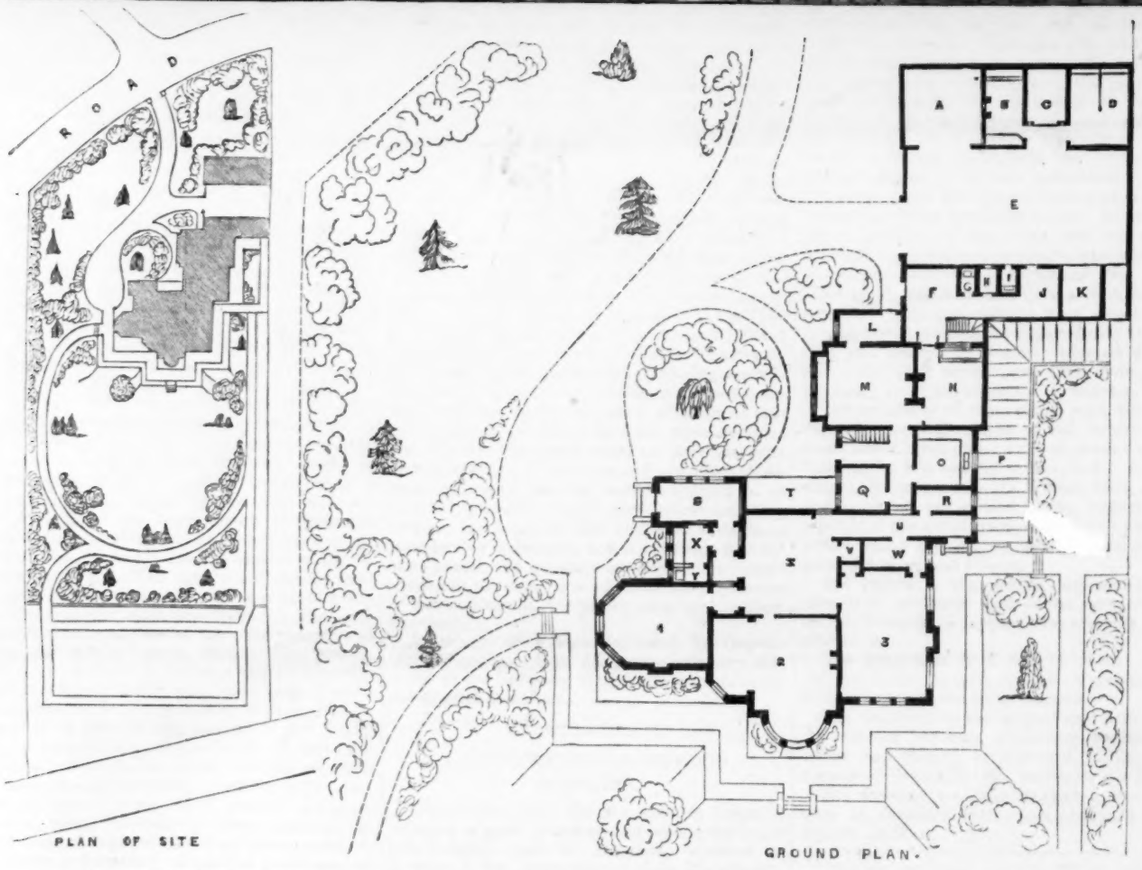
The vaulting of the lady-chapel seen above the reredos has been effectively decorated in colour and gilding, at the cost of the Freemasons of Bristol, by Messrs. Clayton & Bell.

The drawing we have engraved was made from an excellent photograph produced by Mr. Francis Bedford.

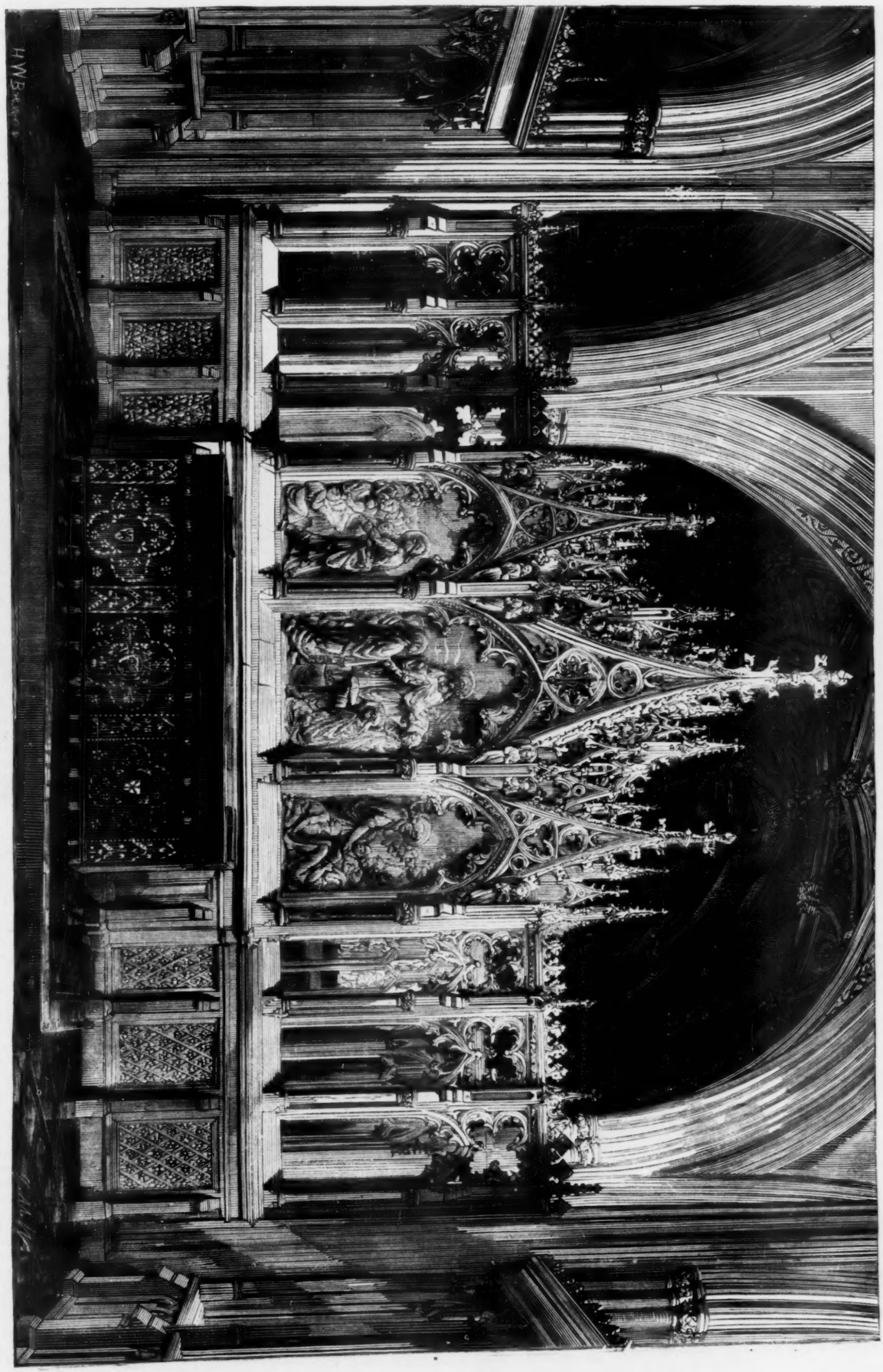
* In a previous volume (xxv., p. 171) we published a design for the reredos and sedilia as at first determined on. Circumstances, including considerations of expense, led to the substitution of the design now carried out.








A COUNTRY HOUSE, BOWDON, CHESHIRE.—Messrs. Horton & Bridgford, Architects.



THE NEW REREDOS IN THE CHURCH OF ST. MARY REDCLIFF, BRISTOL.—MR. GEORGE GODWIN, ARCHITECT.

## BOARD OF TRADE RAMIFICATIONS.

A PARLIAMENTARY paper just published contains information calculated to correct the erroneous impression that prevails to a considerable extent as to the nature of the contents of the portfolio of the President of the Board of Trade, and the business transacted, or rather directed, in and from his bureau. It is supposed by even some well-informed persons that the business of the Board of Trade is transacted in, and almost entirely confined to, certain premises in Whitehall-gardens. This is quite a mistake. The department has offices in various parts of London, and officers stationed in the most remote localities in the United Kingdom. The supreme authority in the department is vested in the president and the heads of various Government departments, including the Lord Chancellor, the Premier, the Chancellor of the Exchequer, the Speaker of the House of Commons, and others. The chief office is at Whitehall-gardens, but in London the Board has subordinate officers at Old Palace-yard, for the Standard Weights and Measures Departments; at 1, Whitehall, where the Designs Registration, and Inspectors of Railways Offices are located; at 13, Serjeants'-inn, where the Joint Stock Companies Registration Office is situated; in Henrietta-street, Dublin; the Exchequer Chamber, Edinburgh; and at Truro, where there are assistant registrars; at New-street, Spring-gardens, where the City of London Gas Act officers have their office; at Adelaide-place, London Bridge, for the General Register and Record Office of Shipping and Seamen; with offices and officers at numerous ports throughout the United Kingdom.

The business of the establishment is divided into six departments, — the Commercial, the Statistical, the Railway, the Harbour, the Marine, and the Financial. The Harbour and the Marine departments employ the largest number of officials. At Ramsgate Harbour 71 persons are employed under the Board; at Holyhead, 28; at Dover, 9; at the Channel Islands, 8; and at Spurn Point, 2. There are 84 officers and servants on the home staff of the Register office of shipping and seamen, including 38 clerks, with from 100*l.* to 500*l.* per annum each; a registrar-general, with 900*l.* per annum; and two boy-messengers, receiving 8*s.* and 12*s.* per week each. There are twenty local marine boards, at various ports,—that at Liverpool employing 64 persons. At numerous other ports collectors of customs and their staff perform the duties of the mercantile marine officers. The Board has 45 persons employed at 23 different localities, in connexion with the survey of steamships, the inspection of crew-spaces, lights, &c. The Board employs 7 authorised receivers of wreck at various ports. It provides 323 sets of rocket and mortar apparatus on the coasts of the United Kingdom for saving lives from shipwreck. The coast-guard officers and men living on the stations are assisted by 131 volunteer companies, consisting of 2,228 men. In addition, there are nine volunteer brigades, for saving life with this apparatus, consisting of 600 men. There are 547 stations supplied with life-belts and lines, not included in the rocket and mortar stations, but under the charge of 75 inspecting officers of coast-guard, and 3 receivers of wreck. These stations include the most remote localities, —the Scilly Isles and Stornoway; Glasgow and Guernsey; Lerwick and Liverpool; Cork and Cardiff; Newcastle and Newport; London and Londonderry; St. Andrew's and Swansea; Plymouth and Padstow; Dublin and Dingle; &c.

At the head-quarters of the Board, in Whitehall-gardens, there are 100 permanent officials and servants, receiving salaries and wages of from 1,200*l.* per annum to assistant secretaries, down to 1*l.* a week paid to the assistant firelighter. The staff includes two professional members of the Harbour and the Marine Boards, who receive 800*l.* per annum each. There are four railway inspectors, in two classes: two have salaries of 600*l.*, rising to 800*l.* per annum; and two with 800*l.*, increasing to 1,000*l.* a year. There are 18 senior clerks and 30 junior clerks on the permanent staff, with salaries of from 320*l.* to 600*l.*, and from 100*l.* to 300*l.* per annum. There are also about 50 temporary clerks and 40 civil-service writers occasionally employed. The draughtsman is paid 700*l.* per annum. The warden of the standards has 900*l.* per annum; the inspectors under the Alkali Act have, one 700*l.*, and the other four,—for West Lancashire, Wales, and the south-west of England; for East Lancashire, Birmingham, &c.; for Newcastle; and for Scotland and Ireland, 400*l.* each. The registrar of designs has 600*l.*, and the assistant registrar 400*l.* per annum. There is an assistant secretary at the head of the office staff of three of the departments, a "chief" at the head of the statistical department, and an accountant at the head of the financial department. These officers receive from 800*l.* to 1,000*l.* per annum each. The three referees under the City of London Gas Act of 1868 have 700*l.* per annum, and the examiner and the auditor 500*l.* each. The Railway department has its powers conferred under no less than 71 general Acts of Parliament, of which 31 have been passed since 1850. The Harbour department has business thrown upon it by 31 general Acts passed since 1850, and the Marine department by 10 Acts.

The salaries and expenses of the Board for 1870–71 amounted to 163,140*l.*, and the fees and receipts for services rendered to 100,467*l.*

## ST. ALBAN'S ABBEY CHURCH.

THE bells in the great central tower were rung for the first time for, it is said, about forty years, on Thursday, the 21st inst. We read in the *Herts Advertiser* that "eight picked members of the College Youths, London, ascended the tower at half-past ten, and rang for the service peal 500 grandsire trebles, and during the day also rang several touches of Stedman treble-bob and grandsires, concluding at six p.m. with three fires."

The bells have since been rung several times, to make the looked-for Christmas music.

As indicating the confidence of the architect in the success, in the main, of the works carried on during the last year and more for strengthening the supports, and tying together the fabric of the tower, at one time, to all appearance, in imminent danger, this will doubtless be considered welcome news by the subscribers to the restoration fund, who have succeeded in preserving at least the most unique portion of this most interesting structure. Let us hope what has been done will be followed, in the course of next year, by the application of similar radical remedy to some other sadly too numerous shaky places throughout the building.

## THE DECORATION OF ST. PAUL'S.

SIR,—The letter of Mr. Lupton in your last reveals some curious discrepancies between the sums promised for windows in St. Paul's, and the sums which the donors were ultimately invited to pay, which may well lead others to think twice before they commit themselves to furnishing a window. But I think that the artistic question is a much more important one than this, and one on which there is much stronger feeling among those who take any interest in that side of the question. The strictures of your correspondent as to the stone canopy and triumphal arch in the "Crucifixion" and "Conversion" windows are perfectly just, but they are beside the mark; for the point really to be deprecated is that we here have a really bad and false style of stained glass art stereotyped at a great expense in the windows already put up; and, not content with this, the committee, it is understood, are ordering a further batch of Munich windows for the rest of the apse, though they are gracious enough to intimate that this type of windows need not necessarily be used all over the church. I do not think the objection about "sending to foreign artists," &c., is of any weight; if we could get better art from the foreign artists, let us have it by all means. But the fact, in which nearly all English critics now concur, is that the whole system of stained-glass design as developed by the Munich school is based on a false principle,—that of making a *picture* of a window, instead of treating it as a transparent flat plane for transmitting light. However good the drawing of the figures may be, the treatment of stained glass in this manner can never be otherwise than vulgar in result, because it is an attempt to do what never can be done on glass except in a coarse and crude manner, and which, when done, looks out of place. The committee would have done much better in spending some of their funds in getting rid of the windows already in the apse, than in getting more of the same kind; and what we may expect from Munich next it is difficult to think of without a shudder, if one may judge from the specimens to be seen recently in the International Exhibition. It seems hopeless, however, to expect any discrimination from the committee on this head, when their own surveyor and professional adviser, in his paper read before the Institute some months since, made the astounding observation that English stained-glass art had very much improved, "owing to the stimulus given to it by these very windows" now in the apse! the fact being patent, I should have thought, to every one that all that is good in modern English stained glass is the result of completely different principles and methods of working, carried to completely opposite results. As to the colours in the German windows, it is better to avoid so painful a subject altogether.

I am glad any one has commented on the dangerous precedent commenced by placing colossal figures in two of the spandrels under the dome. If figures are to be employed in this position, it would certainly appear that they must be somewhat larger than life, to be properly seen; but that the size of the present figures effectually dwarfs the architecture, when viewed in connexion with them, there can be no doubt. The question is whether the architecture is to be regarded as a mere frame for the future pictures, or as the principal interest in itself. If the latter, then, those who allowed colossal figures to be placed there were as short-sighted as Isaiah in the design is made to appear.

Those who do not live in London cannot, of course, see all that is going on in St. Paul's; but the impression produced by occasional visits and by accounts in the papers, is that the building is at present a kind of *corpus vile* to try all sorts of heterogeneous experiments upon, with no very fixed aim. There may, of course, be (as astronomers say there is in the stellar system) a point whence all this seeming confusion may appear reduced to a uniform plan and object: it is to be hoped there is.

One thing ought to be strongly protested against,—viz., the practical (I do not say intentional) misrepresentation involved in using the term, "*Completion* of St. Paul's," in all the appeals made to the public for money in aid of the objects of the committee. The scheme put forth by them is *not* the completion, but the entire remodelling of the interior, decoratively. Do any of the committee pretend to say, seriously, that Wren only put stone pilasters and panels over the church as a temporary expedient, intending eventually to have them cut out, and marble substituted? And if they do not mean this, how can they honestly ask for subscriptions for a scheme which includes this, under the pretence of "completing" Wren's design? I say, that in using such a term they are, whether deliberately or not, completely misleading the public. Only the other day a provincial clergyman, a very liberal man with his money, mentioned to me, incidentally, that he had sent a subscription to the St. Paul's fund, and that he had only since then discovered what was really talked of as the ultimate intention of the committee. "If I had known it before," he added, "they should not have had a penny from me." This is likely to be the feeling of a good many subscribers, when they discover that, under pretence of "completing" Wren's design, they have been asked for their money towards a wholesale hacking and hewing and rebuilding of the interior, never contemplated by the architect, and which, if begun, will never be finished; that, in fact, they have only contributed to keep up the buzz of a tremendous bee which the committee have got into their bonnets.

A PROVINCIAL ARCHITECT.

## "ROYAL VICTORIA PALACE THEATRE."

THE foolish name given to the old "Victoria" is not the only thing to which we are forced to object. First, however, let us mention, according to the card, that the whole of the interior has been re-arranged, so that of the old building the external walls and roof only remain. There are now three floors. The pit is entered on a level with the road, the old pit floor having been about 4 ft. above the level of the road. The first tier or dress-circle is reached by a centre stone staircase, leading from a spacious entrance-hall, laid with tiles. The gallery is gained by a stone staircase, on the left-hand side of the building. Over the entrance-hall is the saloon, 40 ft. by 22 ft., with an ornamental ceiling very badly painted.

There are three tiers of private boxes on both sides of the proscenium.

The upholstery has been executed in a somewhat elaborate style.

The decorations of the ceiling, proscenium, private boxes, box tier, and gallery fronts are in raised carton-pierre ornament. The ornamental mouldings of the ceiling (which is flat, with a ring of lights around it) are somewhat coarse and overlarge.

The wall spaces of the pit, first tier, and saloon, are completely covered with plates of silvered looking-glass of large dimensions, but we are unable to add, with the daily papers, that this "produces a most brilliant effect." On the first night the surface was covered with steam and often will be; moreover, large surfaces of looking-glass at night are always unsatisfactory.

Alterations will be needed in two very important respects: an inner lobby must be formed at the box entrance, to prevent the draughts which at present make the theatre in parts unbearable; and a large proportion of the seats in the boxes and gallery must be re-arranged so that the occupants may be able to see the stage.

Mr. J. T. Robinson was the architect; Mr. Thomas Snowdon, the contractor; and Mr. Watson his superintending foreman. Mr. Fullicks was clerk of the works.

Messrs. Defries supplied the sunlight and float for the stage; and Messrs. Pashley, Newton, Young, & Co. executed the ornament and decorations, under the superintendence of Mr. H. Spry.

## A NOTE FROM WEST BARBARY.

The St. Austell (Cornwall) School Board, of which a baronet is the chairman, offer by public advertisement to "Architects, Builders, &c.," the magnificent sum of 5*l.* for the plans and specifications "which meet with their approbation" for two schools to accommodate 200 children each, with two class-rooms adjoining, each for 50 more children.

"Special attention to be given to providing ample light and ventilation, with good drainage."

The plans and specifications to which the premium is awarded "to become the property of the Board."

Not a word about the ulterior employment of "architect, builder, &c.;" for the best of all reasons:—5*l.* is to be the full remuneration for the best plans and specifications (if indeed *any* meet with "approbation") for school buildings to accommodate 500 children.

This precious advertisement is signed by the "Hon. Clerk." What the deuce does this cheap official mean by "&c."? Presumably he has been to school himself, and it might have struck him that "and *others*" would have been sufficiently comprehensive without being quite so offensive as "&c."

However, the professional readers of the *Builder* will be eager to enter the lists for this capital prize! Z.

*** Architects who respond to this invitation must do so with the consciousness that they are helping to degrade their profession.

## NEW PRIVATE BILLS.

The standing orders of Parliament for the coming session provide that copies of bills to be petitioned for shall be deposited in the Private Bill Offices of Parliament and elsewhere, on or before December 31st. In compliance with this order, copies have been lodged of 303 Bills. In the last great culminating crisis of speculation,—1855,—there were 633 petitions for private Bills, the largest number ever known. The number of petitions sank after that year, but has been again increasing gradually since 1869, when the number of petitions was 212. In 1870, or for the session of that year, the number was 240; for the session of 1871, the number was 275.

The Bills deposited include the Mid-London line for an underground railway from Kilburn to the Marble Arch, thence eastwards in the vicinity of Oxford-street and Holborn to a junction with the London, Chatham, and Dover line near Smithfield. From that locality, the line will pursue its course eastwards to a junction with the East London Railway at Whitechapel. Whether arrangements may be made with the Corporation of London or the Metropolitan Board of Works, to divide the cost or not, is not yet known; but this project affords an excellent opportunity for the construction of the new thoroughfare recommended some years since by Mr. Haywood. The new street would be a continuation eastwards of the great central traffic artery passing along Uxbridge-road, Oxford-street, and Holborn. From the end of the Viaduct the new street would be continued for a mile and a quarter in a direct line to the Commercial-road and Whitechapel. It is proposed to have Mid-London stations at Commercial-road East, Whitechapel, Bishopsgate-street, Moorgate-street, St. Martin's-le-Grand, Holborn Viaduct, Lincoln's-inn-fields, near Tottenham-court-road, New Bond-street, the Marble Arch, and at Kilburn. The line must necessarily be costly, but a large traffic may confidently be depended upon from a communication carried across the centre of London to east and west. It will be well if the Board or the Corporation follow the lead given by the Metropolitan Board in the matter of the new street over the London Central Railway from Leicester-square to Oxford-street, towards which the Board is contributing 200,000*l.*

The Bills lodged include the opposing schemes of the Midland, the Great Northern, and the Manchester, Sheffield, and Lincolnshire Companies, for lines into each other's districts. The Bills are also deposited for the amalgamation of the London and North-Western with the Lancashire and Yorkshire Companies, and of the Midland with the Glasgow and South-Western. The Bill for the amalgamation of the Caledonian with the North British Company will not be prosecuted in this session. Bills are deposited for six schemes for crossing the Severn,—one of them by a tunnel four miles in length, the other five by high level bridges of from two miles and a quarter to 800 yards in length. In connexion with one of these schemes,—the South Midland,—there will be 113 miles of new line constructed, with sixteen tunnels, aggregating about eight miles in all.

There is this year a fair proportion of Irish railway Bills, and as many as fourteen Bills connected with Glasgow.

## OXFORD AND BERKS BRICK KILNS.

The extensive kilns belonging to the Oxford and Berks Brick Company are built on Hoffman's patent principle. They are situated at Wolvercott, about two miles from Oxford. The site is ten acres in extent. About 4 ft. or 5 ft. below the surface is an inexhaustible supply of clay. The brick-yard is easily approached from the turnpike-road. The kiln is adapted for making all kinds of pipes, as well as bricks, and for burning lime. The saving effected in coal over that of the old system of brick-making is said to be somewhat considerable.

The kiln is of a circular form, and about 90 ft. in diameter. It has twelve chambers, in which the bricks are burnt. Each chamber is about 20 ft. long, 12 ft. wide, and 8 ft. high, and will contain about 12,000 bricks. Eleven of these chambers can be made available at the same time, consequently 132,000 bricks can undergo the process of burning at one time. In the centre of the kiln is a circular chimney, 90 ft. high. Its base is 18 ft. in diameter, and its top 10 ft. The chimney, as well as the other portions of the kiln, is built of bricks made by the company. In the kiln around the chimney, between the latter and the brick-chambers are a series of smoke-chambers, where the dampers are worked to regulate the draught through the bricks which are being burnt. The flues from one chamber to another are 2 ft. 6 in. high, and 18 in. wide, and in the upper part of each brick-chamber is a pipe to carry the steam from the bricks to the smoke-chamber. The whole of the chambers are lined with fire-bricks set in fire-clay. One of the peculiarities of this patent kiln is that the coal is supplied from the top, through a large number of feed-holes about 4 in. in diameter, over each of which is placed an iron cap. In the ordinary kilns coal is put in at the bottom, similar to a furnace. Over each brick-chamber are sixteen of these feed-holes, which are supplied with small quantities of coal at short intervals.

The bricks at this kiln are burnt with the common Staveley slack, about 2 cwt. of which is sufficient for 1,000 bricks. In the ordinary kilns, however, not only is the best coal used, but not less than 8 cwt. of it is required to be consumed to produce the same number of bricks. The kiln is intended shortly to be covered over, and after that work is accomplished greater facilities will be afforded for drying the bricks than at present exist. Instead of drying them in the open air, they will be placed on the top of the brick chambers of the kiln, and from which there is a moderate heat through the arched roof. By this means 200,000 bricks may be dried at the same time, and the process of manufacturing them may then be carried on in all weathers. The total cost of this portion of the work has been about 1,500*l.* Since the company was established, up to about six months ago, a small ordinary machine was used, and it was capable of making about 10,000 bricks a day. This machine was driven by a 6-horse power engine. In June last the company purchased a new and powerful machine (Murray's patent) which is capable of making from 15,000 to 20,000 bricks daily. Its construction is somewhat of a peculiar kind. It consists of a large pug-mill, a pair of massive rollers for crushing the clay, and a patent cutting-off apparatus, which will cut bricks to any shape or size. The machine is also adapted to making pipes of any description, merely by putting on different dies, and is driven by a new and powerful double-cylinder 20-horse power engine, by Gibbons, of Wantage. It contains all the latest improvements. The machine is stationed near the mouth of the clay-pit, which is now about 40 ft. deep, and the engine a few yards from it. The clay is at present drawn up by horse power, but it is intended shortly to draw it up, and also pump the water from the pit, with the new engine.

## ON THE PREVENTION OF NOXIOUS SEWAGE EMANATIONS.

Those who talk of drains or sewers being good which require to be flushed, if they speak of regular flushing as necessary for the removal of regular accumulations of *deposit*, do not know what good drainage is. Good tubular sewers or drains should be so constructed in size, form, and inclination to the run of water as to be self-cleansing, and to be always clear of deposit. I have made particular inquiries as to this point, and in every instance where the work has been done according to the instructions provided, it is declared that when taken up after considerable periods, they were found to be "as clean as when they were first put down." If in any instance it is otherwise, the fact is one to be inquired into. Dr. Carpenter declares that at Croydon, where the death-rate has been reduced about one-third by improved drainage, he has not known a case of typhoid fever where there were not some defects in the drainage works about the house or the premises connected with it. And so in other instances. The declaration of the officers in charge is that there is no smell from these self-cleansing channels, but that accidental stoppages occasionally occur, chiefly from servants' carelessness in throwing down what ought not to be thrown down; and the officers declare that the only need of traps and ventilators is to guard against these accidents. As a rule, where there is smell from the drains or the sewers there is stagnant deposit.

The house drainage may be faultless, but in rural mansions it is commonly led to a covered tank in a garden, as in towns to a sewer or deposit, or to a tide-locked dead end, where deposit is occasioned. There it is kept for long periods. In the old sewers in London it is frequently kept for more than a year, or until the sewer, unless periodically cleansed, is choked up. Fresh human excreta is innocuous. If it were not so, mankind, in cities as they now are, would soon be destroyed. The period of noxious decomposition begins in this country, usually not later than about four days in the sewer-tank. Then it is, and there it is, in the distant tank, or in the sewer of deposit, that danger arises. In my report, in 1842, on the sanitary condition of the population, I stated that the position of the sewer of deposit (like the *tank* of deposit), as commonly constructed, was as the bulb of a retort, and that the house-drain, also usually of deposit, was as the neck, conveying the products of decomposition into the house, which was often, at night when shut up, as an inverted receiver for their collection. Of course, through a water-closet opening into a bedroom, the poisonous gases will be diffused there in conditions of more or less intensity. In certain barometric conditions, or when decomposition is rife, the products are sometimes evolved from these retorts to an amount that overcomes all water-traps. I remember the instance of the owner of one large, palatial mansion, who wondered how, and to what malign influence it was to be ascribed, that, just at the time when he had a large party, and at no other time, abominable smells pervaded the house, which was a new and well-built one. The fact was, that the extra fires

and lights on the occasion, in winter time, when all outer doors and windows were closed, constituted a pump, lightening the pressure upon the water-traps or the house-drain, and brought up the products of decomposition from the sewers. If there had been no fires, the traps might have acted perfectly. I have known many first-class mansions to be in the worst conditions, in which a royal progress through them, attended by extra fires, would be a progress of danger to a susceptible person; the conditions being those in which foul air would be drawn in to commingle with the vitiated air from overcrowding, from lights, so as to create a more noxious mixture. First-class hotels on the Continent are, in these respects, often most dangerous places, where I have known frequent fatal cases occur from these causes. Dr. James Johnson, the editor of the *British Medical Review*, was killed (as he has described) by the air-poison in a house in Brighton, where he went for the recovery of his health.

Various means have been proposed and tried for combating the noxious gases evolved from the stagnant deposit. By some it has been proposed, as a complete remedy, to ventilate the neck of the retort, the house drain, at its entrance into the house, and by a shaft lead up the gas and distribute it at the house-top. Where this has been done, sometimes through the water-spouts, the gas has been diffused with fatal effects amongst the occupants of the attics. Moreover, when the basement traps have been defective, and the warm-air pump within doors, as described, has been active, the gas has taken the shorter cut of going into the lower premises. By some engineers it is proposed to ventilate the gases nearer their source, at the sewer, or the tank of deposit, and carry them away by high shafts. Where this has been done, as it has been on the Continent, the gases thus diffused have been found to be nuisances in the suburban districts; a method of ventilation, in which people in the suburbs of Liverpool have had experience, in the ventilation of chemical works by tall chimneys. By one engineer a plan was proposed and tried of ventilating a sewer of deposit by means of a steam jet, with the result of a more rapid evolution of the gases than ever. By one engineer the plan was proposed and tried in Paris, of the ventilation of a sewer of deposit by an upcast shaft, or chimney, through fire. But the products distributed at a distance, if less noxious, were found to be a nuisance, and the process was abandoned. By some manufacturing chemists it is proposed to combat the noxious gases with disinfectants, the more correct name of which was proved to be deodorisers. By one we of the General Board of Health were almost accused of manslaughter for not directing the general application of his preparation of an acetate of lead as a complete preventive. In the strength of his convictions, he, poor man, went with it to extinguish a cholera epidemic, and he was one of those who fell victims to it amidst his own preparations. By some chemists, charcoal powder was insisted upon as a specific. The crew of a ship sent loaded with it to the Crimea was attacked by the cholera, and the faces of the first victims were blackened by the charcoal powder they had been unloading.

The difference of condition between the stagnant sewerage, which is putrid and kills fish, and that of fresh sewage from self-cleansing drains and sewers, which, when discharged into rivers, feeds them and augments their numbers, is not remembered. The most effectual course is not to combat with the gases when produced, but to prevent their production—to prevent the poison pits, and the need of their various materials and services for guarding against them.

EDWIN CHADWICK.

## "DRAINAGE *v.* FEVER."

SIR,—At this time, when the sympathy and alarm of the whole nation have been aroused by the sad visitation of his Royal Highness the Prince of Wales, now happily subsiding, it is quite opportune to offer a few remarks on the state of our domiciliary sanitary matters. I do not for a moment believe in the off-hand recommendation of the *Spectator*, to "hang a few plumbers for murder," as an antidote. We must look more to ourselves. As a practical man, I have been many a time and oft much surprised to observe, in passing along our streets, and casting an eye on the areas below, fronting not only the most moderate of dwellings, but also in some of the highest class West-end mansions, the bell-gratings of the iron traps left off, and in many instances nowhere to be seen, being lost, through ignorance or carelessness in replacing them after the very common but objectionable practice of flushing down all refuse when washing the areas, and forthwith is improvised a permanent, though unseen, *fountain*, as it were, of *miasma*, for the delectation of all open windows above, the same being, by the natural air-current of the street, duly turned into the rooms. I also well know, from constant experience, that the same practice exists in sinks, lavatories, and back-yards to an incredible extent, without any notice being taken of the same. In many houses, also, in bedrooms, where a water-supply exists, as also in butlers' pantries, where glass, china, and decanters are washed, and left inverted to drain, the same neglect prevails, or the duly fastened grating of the waste simply covers an opening into a pipe untrapped, and frequently into a cesspool of stagnant accumulations. Too often the inconvenience is merely looked upon as "an unpleasant smell," and is treated accordingly with a dose of chloride of lime, or other disinfectant, and so the question is for the time settled, or supposed so to be. I had occasion to know of an elegant villa near the Regent's Park, where the upper floor corridor, with three or four bedrooms on either side, had on the landing of the staircase an apparently very convenient covered sink, with water laid on, from which the ewers and water-bottles of the said bedrooms, as well as those on the floor below, were daily filled; the said sink had the *grating of the waste firmly brazed in*, and constantly emitted the most offensive miasmatic effluvia, the said waste having been *duly* (or rather unduly) conveyed through the outer wall by a simple short length of pipe into the outside stack pipe, the lower end of which was plunged and cemented through the area pavement below into an untrapped cesspool drain. I knew also of an instance, in the immediate vicinity of Buckingham Palace, where for years the illness, fever, and general failing of health of the occupiers of some half-dozen tidy-looking dwellings had formed the theme of conversation and notoriety. On being applied to in the matter, I found to my astonishment that the entire water supply of the tenements in question was a leaden pipe running from the main to the cottages, which actually passed *through* and *under* the soil of the privies. The pipe had been for a long time positively rotten, and in parts perforated by decay, and luted, as it were, by the soil itself; so that the supply had been for years impregnated with undeodorised organic matter; and the same most assuredly by flux and reflux permeating (no matter in how homœopathical a degree) the supply of the entire locality. Going from "Omega" to "Alpha," I had the honour, some two years since, of being consulted by H.R.H. the Grand Duchess of Mecklenburg Strelitz, on the sad state of the internal atmosphere of the new palace at Neustrelitz, one of the most magnificent residences in all Germany, which, at almost endless cost, had for years occupied the highest English and Continental talent in its erection and decorations. On proceeding thither personally to examine into the matter, I found that everything connected with the closet and water-supply had been got up with the most costly outlay and appliances, as regarded style and appearances, but the sanitary arrangements were an utter mockery and sham, painfully corroborated by the tainted air of the entire interior, as though that part of the affair was quite of a subordinate character; and I had to return to England, and, taking with me a whole array of proper apparatus and accessories, proceed again to Mecklenburg, and take up the entire existing arrangements and remodel the same throughout, with, I am happy to say, every desired result, as I have the honour of holding the written testimonial of her Royal Highness, acknowledging the same. Such instances as the above exist all over England, as is patent to most practical men, and should be looked to. In many cases it has arisen from a species of apathy as regards the unseen of the household so long as the ornamental, the decorative, or the admirable is satisfied; or else there must exist a sad lack of information as to the really simple principles of the whole question. Again, during the last twelve months, it has fallen to my lot to undo and remedy very sadly defective drainage in one of the most extensive West-end hotels, where the great cost of erection ought to have insured perfection, but misplaced provisions and complication of access to the same had together conspired to create very serious annoyance, and would have been worse but for the unflagging attention of the management, combined with the purity and salubrity of the site. However, all this is amended, and is now as it should be, changed and perfect. I believe, sir, that all the regulations of the Board of Works, of the district authorities, or of local orders, will go for nothing in doing away with this state of things, unless a proper house-to-house visitation is made from the mansion to the hovel, and reports duly made, unmasking that which requires remedying, and from which the Board of Works, or other authorities, may base their imperative orders for amelioration. Further, if proprietors about to build, or alter (whether mansion or estate), will only give the professional gentlemen architects whose aid they enlist a proper discretion, the latter, who well understand both the matter and its importance, will assuredly issue such details of drainage in the specification as will leave the contractor or his plumbers but little option in the matter, and a good result will ensue. Even the trashy so-called pan-closets of commerce (so aptly alluded to by Mr. T. Suffield, in his letter in your number for December 23rd) will become cashiered, as all architects are fully conversant with the productions of many first-class firms, and would, upon principle, recommend none other.

HENRY R. WAGNER.

## "JACK PLANE."

WILLIAM RANDALL, whose death by accident we mentioned in our last with much regret, has left his wife and seven children unprovided for. Some of the master-builders may be willing to show their appreciation of the good, from their point of view, his letters were calculated to do; and we willingly mention, at the request of a correspondent, that the family live at No. 34, Swinton-street, Gray's-inn-road. Messrs. Henson, Brothers, of No. 4, York-place, Portman-square, say that Mr. Randall worked in their firm for the last fourteen years, and that they always found him an industrious, well-conducted man. They will willingly receive any contributions that may be forwarded to them.

## BRICK.

THE reference to the "Glossary of Architecture," given in the *Builder*, p. 952, has forced upon my attention a point which I had purposely avoided, as open to misconstruction. We have to consider how the word "brick" was first introduced to England, and to avoid confusing it with the word *tile*.

The Romans used tiles of all sorts, but they were not *real* bricks, in the modern sense of the word; a *tile* is derived from the Latin word *tego*, hence *tegula*, "a tile," shelter, or covering; brick is said to be a corruption from *imbrex*, *imbricis* a synonym for *tegula*; it means the gutter-tile, or roof-tile; from this we have our modern word to imbricate, or "work with tiles."

The author of "Domestic Architecture in England" (Oxford, 1859) writes,—"The earliest use of *moulded* bricks has not yet been investigated."—Part ii., p. 283.

Further,—"It appears that there is no mention of *brick* in any ancient building account. . . . The silence of early records on this subject . . . may be accounted for by supposing that bricks continued to be made in the Roman fashion, and passed by the name of tiles."—Turner's "Domestic Architecture," p. xxvi. (Oxford, 1851).

Your correspondent, Mr. Bedo, quotes an inquisition, at Faversham, *temp.* Hen. III. It is open to question what these bricks were, and, I suppose, it would be called "ancient," in Mr. Turner's sense. His date, 1216–1272, covers the alleged date of Little Wenham Hall, Suffolk, to which he also refers; but unfortunately other authorities state that this mansion was built in 1569. There are dates of erections at different epochs; it is a matter of great interest to ascertain to which era the "bricks" really belong.

My view of the matter is, that the art of tile-making, as introduced by the Romans, was never quite lost in England; that brickwork, in its modern sense, "to imbricate," first arose from the custom of giving houses a facing of *tile*, pendant along the front wall to keep out the weather; and that, subsequently, baked bricks, called bakateen, *i.e.*, baked stone, were introduced from Flanders.

We have "Tylers" in plenty, but no patronymics in brick. Lydgate, *circa* 1460, uses both:—

"——— made of tyles hard of bake
Fro touch of fire to save the Scripture."

2.

"Eke in pillars of bricke full hard y-bake
Which wer up set, long, large, and huge."

It might appear that both words are used in the same sense, but that the first quotation has reference to a tiled fireplace, and we know that moulded bricks were used before 1460. A. Hall.

## IMPROVEMENTS IN SALT MAKING.

Two years ago a visitor to the Salt Works of Messrs. Hamer & Davies, at Wincham, near Northwich, noticed what appeared to be some decided improvement in the salt-boiling and evaporating process. Letters patent had been taken out for the machinery invented, to effect the work which has usually to be done by hand labour under peculiarly disadvantageous circumstances, from the heat and steam in which the salt-boilers had to be enveloped during the process of "drawing the pans." The firm have had three pans at work on the improved principle since, and the members of the trade have been allowed ample opportunity of inspecting the process.

During the period which has since elapsed other improvements have been added at the works. The salt on being taken from the pans, instead of being put into carts and taken into the store by men, is now put on to a travelling carriage or elevator, and carried up into the roof of the storehouse, where it is tipped so as to fill the store on all sides equally, by which the salt is kept cleaner and in better condition from not having to be handled until loaded into boats or railway trucks. A further improvement has now been effected at these works in the manufacture of salt of any description. The first have obtained a patent for supplying the evaporating pans with heated brine, instead of allowing it to flow into the pans in its natural cold state. The advantages of this improvement are that it enables the firemen to keep the pans at a more equable temperature with less labour, and consequently with less damage to the pans and furnaces. This contrivance is ingeniously carried out by throwing the exhaust steam from the engine or from the steam boiler into a large tube, this tube having a second one through its centre, which contains the brine on its passage to the evaporating pans, thereby heating the brine, and at the same time condensing the steam. This condensed steam then becomes very hot water, which is used to feed the steam-engine boiler, and thus a very small quantity of fresh water is needed for the boiler, and considerable less mud and scale is generated, an important desideratum where the water supply is very impure. These improvements appear to be working satisfactorily.

The point which suggests itself as most important is the desirabilty of devising means for saving the men, and, in some cases, women, from the degrading occupation to which they are subjected in salt-boiling.

## THE INSTITUTION OF CIVIL ENGINEERS.

The Report at the last annual general meeting stated that, in the past session, an address had been presented by a numerous body of members and associates, recommending that the number of the council should be increased from seventeen to twenty, the maximum permitted by the charter; that two of such additional councillors should be from the class of members and one from the class of associates, and that each and every year two of the members and two of the associates of council should become ineligible for re-election until after the expiration of one year. The result of the deliberations of the council on this proposal was in effect, that the suggested increase in the number of their body was neither necessary nor desirable for efficient administration, and that the compulsory retirement every year of the two senior members, for that must have been the ultimate result of the measure as proposed, would, in their opinion, be prejudicial and disadvantageous to the interests of the Institution. A requisition having been made for a special meeting of members only, to consider the question, such meeting was accordingly convened, and certain modifications finally were adopted.

Owing to the increasing number of applications for admission into the Institution, and for transfer from the class of associate to that of member, the council had had under consideration the rules and regulations respecting the qualifications of candidates. These seemed to be amply sufficient, if strictly adhered to, to insure the election only of those whose avocations and antecedents were such as to render them worthy of the privilege. It had, however, been pointed out that in every case the statement of qualifications must embrace a full and consecutive narrative of the career of the candidate, and that the proposer and seconders must have a *personal knowledge* of the details of the qualifications upon which the application was based. During the past session 11 associates had been transferred to the class of members. The elections had comprised 26 members and 102 associates, together 128, while the deductions due to deaths, resignations, and erasures amounted to 45, leaving an effective increase of 83, being at the rate of 5 per cent. in the twelve months. There had been 50 admissions to the class of students attached to the Institution, and 20 had been removed from the list from various causes, so that the net increase was 30 or 17 per cent. There were on the books on the 30th of November last 14 honorary members, 724 members, 1,048 associates, and 203 students, together 1,989, as against 945 ten years ago.

## ACCIDENTS.

*Arundel.*—A young man has been killed by a fall from a scaffold at the new Roman Catholic church now in course of erection here. The deceased was a labourer. About half a dozen men had just fixed a large stone on the top of the building, about 60 ft. from the ground, and the deceased went down on his hands and knees on the upper scaffold to jump down on to a lower scaffold which is five boards wide, each board being 9 in. wide. The deceased got down backwards, and on reaching the lower scaffold he fell backwards from the scaffold to the ground. He was quite insensible, and died in about ten minutes. The deceased had been spoken to by Mr. Addis, the foreman, and reproved for his recklessness. A verdict of accidental death was returned by the coroner's jury.

*Newcastle-upon-Tyne.*—At Dunston, on the south side of the River Tyne, a new engine-factory has been blown to the ground by a hurricane; the walls were only two bricks in thickness. The workmen received timely warning by the swaying of the walls, and ran out of the way; but Mr. Archer, senior, a propietor of the factory, and a boy were buried in the ruins. They were extricated after considerable difficulty. Mr. Archer was in an unconscious state, and very seriously injured about the feet and head. He, however, is expected to recover. In Newcastle and Gateshead considerable damage has been done to property by the gale.

## BRADFORD COVERED MARKET.

The works for the covered market which is now being built were let in December, 1869, for 12,500*l.*; but this structure is only a part of the Kirkgate market scheme, as it only extends from Kirkgate to the first opening in Darley-street; whereas the complete scheme provides for its being carried forward to Godwin-street above. Messrs. Lockwood & Mawson are the architects, their plans having obtained the first prize offered by the Corporation for market designs. The building is in the Italian style of architecture, the principal ornamentation being at the Kirkgate front, where is the main entrance to the building. The interior is arranged on the pavilion principle, and there are four avenues. It is 45 ft. high, the roof being supported by light iron columns and arches, and so arranged that the northern light is principally admitted. There is ample provision for ventilation, and keeping the place cool during hot weather. Altogether the market will cost 20,000*l.*, exclusive of internal fittings; but as yet the Corporation have not entered into contracts for the erection of the second portion. When the scheme is completed there will be thirty exterior shops, eleven in Godwin-street, eleven in Darley-street, and eight in Kirkgate. Ten of these shops are now in course of erection, and they will form the finishing of the Kirkgate front of the market. The contracts for building these shops were let in June last for the sum of 7,950*l.*; and it is expected they will yield an aggregate rental of 1,400*l.* or 1,500*l.* a year.

The covered market, according to the original terms of the contract, was to have been finished in March of the present year; but difficulties as to the delivery of the ironwork, and some other unforeseen circumstances, caused considerable delay with the work. During the past few months, however, the progress has been more rapid, and workmen are now engaged in fixing the roof. This portion of the market stands upon the ground previously occupied by the Manor Hall and the ground immediately adjoining. The site has the disadvantage of a steep gradient, necessitating the ascent of a considerable number of steps from Kirkgate entrance (thirty, it is said), and a like number will have to be descended from Godwin-street when that part of the building is erected. Some carved work has been executed on the front of the Kirkgate entrance, including two figures representing the "Goddess of Plenty" and the "Goddess of Flowers."

In connexion with the market,—forming, in fact, a portion of the exterior buildings of the covered market,—another block of buildings is approaching completion in Godwin-street. It is three stories in height, and has lofty attics. The block begins with the line of the street opposite the "Butter Cross," and extends to the line of James-street. The central portion of the building is intended as a market tavern. The roofing of the building has just been completed, and it is expected the whole of these premises will be ready for occupancy by March next. The works for the erection of this block were let about fourteen months ago for the sum of 4,400*l.*; and are expected to yield to the Corporation a yearly income of 600*l.* or 700*l.*

## AS TO TOWN HALLS.

Sir,—Our city being at this moment without a public hall suited to its requirements, a meeting was held a short time since to consider the advisability of erecting one. A committee was appointed to take the initiatory steps, to which I have the honour to act as secretary. My object in trespassing upon your courtesy is to ask if any of your numerous readers, among whom are doubtless many who have had experience in similar buildings, can and will kindly give me a leading hint or two as to the approximate cost and construction of a building capable of seating 1,500 to 2,000 people, and easily convertible into a concert-room, theatre, ball-room, sale-room, &c.; or probably some one might be able to inform me where there is a building of this character which one or more of our committee could inspect. Should you be able to afford space for my request, I shall be most grateful. Charles Wynne.

*Carlisle.*

## LETTER-BOXES AND BUILDERS.

Sir,—Will you kindly give space for these few remarks in answer to the letter-box question in your last number?

With all deference to the Postmaster-General, I am bound to say that he has never been a builder, or he would be more considerate for them. A builder is now required to almost furnish a house for a tenant: he is bound to put cupboards or presses in nearly every room in the house, to fit up every window with blinds, to fix sideboards, fit up the house with gas, find a plate-rack and many other items to spare furniture; so that in reality a tenant has nothing whatever to give him an interest to stay in the house any longer than he has made it dirty and uninhabitable;—then he prefers a new house. This letter-box question is a matter of interest between the tenant and Postmaster-General, and has nothing whatever to do with the landlord. W. E.

## LEEDS BRIDGE IMPROVEMENT: ARBITRATION CASE.

An arbitration on property belonging to Mr. William Emsley, agreed to be purchased by the Corporation, to enable them to carry out the improvement in connexion with the Leeds new bridge, has been gone into at the town-hall. Mr. Richard Gouthwaite, of Lumby, was the arbitrator. The property consists of shops at the south-east side of Leeds Bridge, and some warehouses behind.

Mr. Shaw, in opening the case for the claimant, said that the Corporation had agreed that the compensation should include not only the value of the property, but also Mr. Emsley's interest in the bed of the River Aire, and damages for a trespass by the contractor for the bridge.

Mr. Thomas Newsam, of Leeds, land surveyor, stated that the property was in a most excellent situation, and on the traffic side of the bridge. The land on which the buildings were erected was worth 10*l.* 10s. per yard. The property which was occupied produced a rental of 316*l.* 10s., and the unoccupied portion was worth 100*l.* per annum. He thought that the estate was let at a very low rental. The front portion of the property was worth twenty-four years' purchase, and the back part twenty years' purchase. That would amount to 9,156*l.*; to this, in an ordinary case, would have to be added 10 per cent. for compulsory purchase, but he was of opinion this was a case where 20 per cent. ought to be given, considering the advantages the Corporation would obtain in the erection of the new bridge by the purchase of this property; that would make a total of 10,987*l.* 4s., exclusive of the damages to be awarded for trespass.

Mr. George Corson, of Leeds, architect, valued the land at 10*l.* per yard, or 5,230*l.*; the buildings were worth 3,819*l.* 18s., making a total of 9,049*l.* 18s., which, with 20 per cent. for compulsory sale, would make 10,859*l.* 17s. 7d.

Mr. Thomas Whiteley, of Leeds, builder, agreed with the evidence of Mr. Corson.

For the Corporation,—Mr. Thomas Fenwick, of Leeds, surveyor, said he had valued the estate, and considered that the fair rental of the property, occupied and unoccupied, was 340*l.*; from this he would deduct 30*l.* 15s. for repairs and painting, making a net annual rent of 309*l.* 15s. Part of the property was worth twenty years', and the remainder eighteen years' purchase. The total value was 5,791*l.*, to which he would add 10 per cent., or 579*l.* for compulsory taking, which would make a total of 6,370*l.* He was of opinion that 5*l.* per yard was a fair value for the land.

Mr. Christopher Dresser, of Leeds, architect; Mr. Perkins, of Leeds, architect; and other witnesses, gave similar evidence.

The arbitrator reserved his decision.

## CAMBERWELL VESTRY HALL COMPETITION.

SIR,—A letter, signed "Another Competitor," appeared in your last week's issue, in which was a statement that, "according to the *South London Press*, six out of the eight selected designs could not be placed on the site."

As ours was one of the designs in which this supposed defect was discovered by the critic of the local paper mentioned, we shall be glad if you will allow us to state that the editor of the *South London Press* has since been good enough to correct the error into which he had fallen, and inserted in his paper, dated the 23rd inst., an article admitting that, upon the point mentioned, we had been unfairly criticised.

THE AUTHORS OF DESIGN MARKED "THOROUGH."

## THE ORDNANCE SURVEY AND THE BRITISH MUSEUM.

SIR,—It appears, from the *Saturday Review*, December 16, 1871, that, according to the statement of Mr. Stanford, the publisher of these maps, the complete map of England and Wales,—one inch to a mile,—is now published, with the hills, engraved in 110 divisions." It appears, also, from this statement, that, besides the "Ordnance Plan of London,—on the scale of 5 feet to a mile,"—there is a "New Ordnance Plan of London, and its environs, on the scale of 25·344 in. to a mile."

Various parish estate maps have been published, of Scotch and Irish parishes, as well as those of twenty-five in Hampshire, Kent, and Surrey, and 6-in. county maps of Hampshire, Kent, and Middlesex. Under the Copyright Act, I believe that the publisher is now compelled, under a penalty, to send a copy of all maps published by him to the British Museum Library within a certain time after publication; but many of the above-mentioned maps are not yet indexed, nor are those of Jerusalem, and other cities and towns in England and Wales, already published.

CHR. COOKE.

## "CLOSETS."

SIR,—I fully endorse all that is said by Mr. Suffield in respect of the pan-closet, which is, I have after a good deal of experience come to consider, a great mistake; for why should we seek to retain a nuisance, only covered by a trap which is so very liable to be disturbed, and so rendered no trap at all?

It is, however, proverbially easy to find fault; perhaps hardly so to provide a remedy. I, however, suggest that which I found, in building my own house, to fully answer the purpose, viz.:—Let the lower end of the soil-pipe, when it joins the town drain, pass through a common syphon-trap; continue this pipe (mine was of stoneware, and did not, therefore, cost much) upwards to the top of the nearest stack of chimneys, when the orifice must be covered by a grating to keep out the birds; then a simple closet (I mean only the earthenware pan and trap) connected with this pipe, is all that is required; with also an arrangement for the supply of water; but a little water will then clear the trap, and it is only necessary to use so much to make it secure.

In building my house I used the pan-closet, and in due course experienced the defects of it; it is only some months since that the idea of substituting the simple earthenware pan and trap occurred to me, and it is I think right; for we certainly do not need the "container" to store up that which would be far better away.

J. J. FRANKS, C.E.

## ARCHITECTS AND EMPLOYERS.

SIR,—We are in the middle of a little trouble, and cannot exactly see how to get out of it. As we have been to more than one solicitor, and they tell us they cannot explain the law upon the point, as it is a very unusual one, perhaps you will kindly tell us, in your opinion, what ought to be done, and no doubt your reply will satisfy all parties concerned.

A gentleman, whom we will call Brown, is building a house; he employs an architect, whom we will call Jones, who advertises the job for public competition. Jones, sen. (who is Jones, the architect's, father), succeeds in getting it, and during the progress there were so many alterations made, that by this time no one can tell which are extras and which are not. The money was to be paid in draws, which were not to come oftener than once in eleven weeks. These were made upon certificate from the architect. Brown now thinks he has paid cash enough, and refuses to pay the last three amounts certified by the architect, he being the builder's son. Brown thinks he is favouring the builder too much. Now, we want to know if Brown has any right to refuse to pay these certificates when presented, and if so, if there cannot be a writ issued against him at once for the whole of the amount declared due by these certificates, as we presume if an architect certifies for more than a job is worth, he, and only he, is answerable to his employer. I may here say, that after the conditions and specification were signed, through the builder and architect being father and son, the architect's employer thought he would have an agreement, and appoint a referee for himself and one for the builder, who, if they could not agree, were to call in an umpire, whose decision should be binding; but two days before this agreement was signed by Brown and the builder, the architect writes to Brown, and says he cannot recognise such agreement at all, as it would divest him of all power as the architect; nevertheless, Brown and the builder sign this agreement as to referees, &c.

The job is now nearly completed, and, as Brown refuses to part with any more money upon certificate, they all have a meeting, and the two referees appoint a builder as umpire, and order him to measure the work, and see if there has been too much money paid or not. To this the architect objects, and says no one has any business to measure, or do anything until the job is completed, and his *final certificate* given, and refuses to give up the plans for that purpose.

The builder's creditors are pushing him on all sides, and in case he gets into difficulties, will not Brown be answerable for any damage or expenses the builder may sustain through refusing to pay these said architect's certificates, the amount which is now owing upon them being 900*l.*, and the job up to this time has cost over 3,000*l.*

If you can give a reply to this in your next issue, it would very greatly oblige all parties concerned, I know, and I think will be considered conclusive, and your opinion abided by, and thus save the matter drifting into the Law Courts.

C. A. B.

*** Notwithstanding our correspondent's belief, we feel sure our opinion, if it were given without further information, would *not* satisfy all parties, nor would they be wise to bind themselves to it. The architect under ordinary circumstances is the employer's agent, and can bind him. But in this case the employer, by the second agreement, takes the matter, to a certain extent, into his own hands, and the exact bearing and weight of the two documents would have to be considered together. The moral of the story is, that an architect should avoid employing his father to do work under him, if he desires to retain his employer's entire confidence. However honourable he may be, the fear that he is "running with the hare and hunting with the hounds" is pretty sure to arise.

## SCHOOLS OF ART AND OF SCIENCE.

*Manchester School of Art.*—The annual meeting and distribution of prizes, in connexion with this society, were held in the Royal Institution, Mosley-street. Mr. Tom Taylor distributed the prizes. In course of his address he said,—

"What I wish to insist upon here to-night is, that they were not mistaken who originally insisted on the importance of teaching design; in other words, of bringing art into living and fruitful contact with industry in this country. At least, if they were mistaken, I think it must have been in expecting too speedy a recognition of great truths, and too rapid a reduction of them to action. They did not over-estimate the value of the crop for which they were sowing the seed, though they may have looked for the harvest too soon. Or were they really mistaken as to the quality of the soil? Is England really ground in which art will not grow, except as an exotic? Shall we acquiesce in that conclusion, which a few have maintained boldly, and which many, I fear, secretly hold, as a more or less complete conviction? I, for one, do not believe it."

The financial statement showed that for the year the receipts amounted to 909*l.* 13s. 2d., and the payments to 939*l.* 13s. 7d., which left a balance now owing of 139*l.* odd, including a deficit last year of 109*l.*

*Newcastle School of Science and Art.*—The annual meeting of this institution was held in the Town-hall. There was a large and influential attendance. The chair was taken by the Rev. J. S. Broad. The report of the head master (Mr. J. P. Bacon) said,—"The school has continued to progress. The attendance has been greater, and the results, as shown by the number of prizes awarded, are in excess of last year. I take this opportunity of remarking, that should the interest which is now manifested in the school increase,—and I see no reason why it should not,—at no very distant day more accommodation will be required for our classes than we at present possess." The report of the teachers of the science classes (Messrs. Ainsworth and Brade) stated that, "in November, 1870, a class for the study of chemistry was opened at the laboratory of the sugar refinery, Newcastle, and attended by fourteen students. At the examination held in May last, all who sat were successful." The statement of accounts showed that the receipts had been 97*l.* 2s. 4d., and that the balance now in hand was 10s. 7d.

## BUILDERS' DIFFERENCES.

ANOTHER list of tenders, which appeared in your journal of Saturday last, induces me, as one of the public, to ask for some explanation of a difficulty, which, I confess, to my unenlightened understanding, seems by no means easy to solve.

I allude to the extraordinary differences in amount between the higher and lower tenders for building works, even in cases where the plans and specifications have been carefully prepared, and the quantities supplied at the expense of the employer.

In the case of the Chailey New Union, I observe that the highest tender is 17,139*l.*, while the lowest is 9,925*l.*,—a difference of no less than 7,214*l.*, or about seven-nineteenths of the higher figures.

Nor is this at all a singular or extreme instance. In former publications of your journal I have frequently observed still more glaring inequalities of prices; and I remember some months ago being much struck by some forcible observations which were made in your columns upon this subject.

Notwithstanding these observations, however, and letters which have also appeared from time to time in your columns of such a nature as to invite at least some explanation from the building community, I am not aware that the faintest attempt has been made by any member of the trade to reconcile or explain what naturally appears to the unenlightened public a very startling anomaly.

One would have supposed that the prices of labour and materials were, in these days, as well known and regulated as the price of provisions, and that it would be almost as imprudent and dangerous for a builder as for a butcher or baker, to charge a profit of 70, 80, or even 100 per cent. beyond his fellows in the same trade; and yet, if the tenders to which I have alluded are, as they profess to be, genuine quotations of prices for works to be executed,—if 6,000*l.* be a fair price for one man, and leaves him a fair or even any profit, what profit must another man look for, who demands 10,000*l.* for the self-same amount of work?

I hope I may be forgiven for inviting attention to this subject, inasmuch as it is to me, as to many others of the public, a matter of very serious interest. I have paid many thousands of pounds to various builders, and I probably shall have to pay many thousands more; and I must candidly confess, that, in making my choice of the best men to employ, I should (prudently and naturally, as it seems to me) avoid dealing with builders whose prices and profits appear to exceed so enormously the prices and profits of the others in the same way of business.

I trust this letter may really elicit some reasonable explanation of my difficulty.

A LANDOWNER.

## CHURCH-BUILDING NEWS.

*Bristol.*—St. Clement's Church, which has undergone extensive repairs and additions, has been re-opened for divine worship. The work of church renovation has been going on for two years. The south wall having been found in a dangerous condition, it was pulled down; an arcading similar to that on the north side has been erected, and a new south aisle added. The north aisle has been re-roofed to correspond with the south one, and the windows of the clearstory over both have been enlarged and filled with stained glass. A carved reredos and pulpit, of Bath stone, have also been provided. The lighting of the church has been improved by the provision of four coronas hanging from the ceiling of the chancel and the nave, the roof of both having been re-covered with stained and varnished boards. The tower has been raised 30 ft., the total height contemplated when funds are forthcoming being 90 ft. Mr. Lloyd has been the architect, and Mr. J. W. King, of Clifton, the builder. The total cost has been 1,800*l.*, and 400*l.* of this amount remain to be raised.

*Overton, North Wales.*—The ancient church of Overton was recently re-opened by the Bishop of St. Asaph, after having undergone a restoration. The nave and aisles have been recast. The walls and pillars have been cleared of whitewash, bringing to use the red sandstone of which they are constructed. The architects suspected (finding there was no base to the pillars) that the original floor existed beneath, and on examination found it to be so, and thus brought the bases to light, which naturally improved the proportions of the interior. In addition a clearstory has been raised over the nave, and an entirely new roof has also been constructed of hammer-beam construction, and the bays between principals boarded in a vaulted form. The church has been re-seated with low, open benches, having sloping seats and leaning backs, and attention has been paid to comfort and accommodation for kneeling. The organ, with seats for the choir, has been removed from the west to the east end of the north aisle, to a small chamber constructed for the purpose. The music, as well as the voice of the preacher, has been aided, it is said, by the new roofs being boarded. Externally, the pinnacles and parapet of the north aisle have been removed. The roof, finished with plain eaves and buttresses, completed with a temple coped water-table, and the projection of the organ-chamber beyond the transept, gives it a distinctive form it did not

before possess. These works, as well as the alterations to the chancel carried out a year or two ago, have been completed under the charge of Messrs. W. M. Teulon & Cronk, architects, London and Sevenoaks, by Mr. John Edge, builder.

*Wath-upon-Dearne.*—The work of interior restoration of All Saints' Church, Wath-upon-Dearne, has now been completed by the erection at the east end of the chancel of a carved stone reredos. The reredos extends across the eastern wall, the central portion being slightly raised, and surmounted by a carved cornice, between canopied buttresses, while the side portions form a traceried wall arcade. Under the window, in a canopied and crocketed niche, over the communion-table, is represented in relief the Gospel incident recorded by St. Luke, the Supper of our Lord with the two Disciples at Emmaus. The design was by Mr. Charles Hadfield, of the firm of M. E. Hadfield & Son, and the style is that which prevailed at the beginning of the sixteenth century, the late Perpendicular or Tudor period. It has been designed so as to harmonise with the rest of the chancel fittings, and with the stained window below which it stands. The material is Caen stone, and the carving was done by Mr. Earp, of London, from the architect's designs.

## DISSENTING CHURCH BUILDING NEWS.

*Gorton.*—The Brookfield (Unitarian) Church at Gorton has been opened. The church is erected in place of the old chapel, which will shortly be taken down. It fronts the Hyde-road, on a site adjoining the present schools and burial-ground; the grounds (which are now being laid out and planted) are enclosed by a stone wall, with iron railing and gates towards the road, at the end of which is a keeper's house, and on the other sides with walls of a plainer character. The main entrance to the church is through the tower, on the north side, the lower part forming the porch. Above is a ringing-chamber and belfry, containing a peal of eight bells (by Messrs. Mears & Stainbank, of London). The tower is of more ornamental and elaborate character than was at one time intended, and is finished with a spire, which rises to a height of 150 ft. from the ground. At the angles are carved the emblems of the four Evangelists, "The Angel, Lion, Bull, and Eagle." The building is Geometric Decorated. It is faced with stone on the outside, having ashlar dressings of Darleydale stone; and the spire is wholly built of the same description of stone. The church consists of a nave, 77 ft. long, 21 ft. wide; north and south aisles, each 70½ ft. long, 10½ ft. wide, making a total width of 42 ft. inside; chancel, 25 ft. long, 19 ft. wide, the communion being raised above the floor of the nave by three steps; organ-chamber on the north side of the chancel, and vestry on the south side. There is also a porch on the south side, near to the schools, and convenient for the use of the teachers and scholars. The church contains sittings for 264 adults, 162 children, and 24 singers in the choir: in all, 450 persons. Internally there are polished red granite columns between the nave and the aisles (which divide the length into six bays), and to the shafts of the chancel arch; the arches being all of stone. The chancel floor is laid with encaustic tiles. The roofs are of pitch pine, with the timbers exposed to view, and the internal woodwork generally, including the seats in the nave and aisles, is also of pitch pine, stained and varnished; but the choir stalls and wood fittings in and adjoining to the chancel are of oak. All the windows are filled with stained glass, in geometrical patterns, by Messrs. Lavers, Barraud, & Westlake, of London; and the east window in the chancel, containing four lights, is of a more elaborate design, having in each light a device formed by the palm, lily, rose, and vine, with suitable texts, the lower part being of grisaille work, and "The Lamb" in octafoil above. The church will be lighted by six brass coronæ, suspended from the nave roof, and a larger one in the chancel, with two brass standards (one on each side of the communion-table). These are all the work of Messrs. Thomason & Co., as is the metal work generally. A large organ has been built by Mr. Jardine, of Manchester. The church is heated by Messrs. Haden & Son, on the hot-air system. The building has been erected by the general contractors, Messrs. Clay & Sons, of Audenshaw. Mr. Thomas Worthington, of Manchester, was the architect, under whose direction the whole of the work have been carried out. The cost of the church (exclusive of the keeper's house, boundary walling, and some other outside work), will be defrayed by Mr. Richard Peacock, of Gorton.

## SCHOOL-BUILDING NEWS.

*Cambridge.*—St. Matthew's School-room for the poor and populous ecclesiastical division of Barnwell, designated the St. Matthew's district, has been opened. The situation of the building is in Norfolk-street. It stands on a slight eminence immediately at the back of the cemetery. The building, which partakes of the Gothic style of architecture, is of white brick, with slated roof, and is devoid of any great amount of ornamentation. The dimensions of the main room are 70 ft. by 30 ft., with an elevation of 14 ft. to the eaves, and 27ft. to the ridge, thus giving a roof of 13 ft. The interior of the roof is covered with match-boarding, which, with the seven cross-beams, of Memel timber, are simply varnished. At each end of the school-rrom is a triplet window, and four pairs of lights facing Norfolk-street. The floor is boarded, and at one end there is a raised platform (20 ft. by 7ft.) clear of the entrance. The whole building is warmed by hot-air flues, laid flush in the floor, and covered with iron grating. A class-room (14 ft. by 20 ft.), is to be erected on the south side of the school-room, with which there will be internal communication. The builder was Mr. John Dixon, organist of St. Matthew's Church. The cost of the building is 400*l.*; that of the ground, 144*l.*

*New Malden.*—The boys' new National School at Malden, has been formally opened. School accommodation has been provided for 327 children. A portion of buildings has been occupied for some time past as a mixed school for 207 girls and infants, but now another room has been built for 120 boys. The architect was Mr. Freshwater, of Malden; and the builders were Messrs. Spearing & Stewart, Surbiton.

*Kingston.*—The temporary national schools, in connexion with St. Paul's, Norbiton, are about to give place to larger and more substantial buildings, the first stone of which has been laid by the Bishop of Winchester. The plans, which have been prepared by Mr. C. L. Luck, architect, Surbiton, show accommodation for 140 boys, 123 girls, and 156 infants. Each school will have a separate class-room. The buildings, which are to be erected in the Borough-road, will be constructed with red bricks, with tiled roof. The total cost is estimated at 1,700*l.* The builders are Messrs. Todd & Saunders, Kingston Hill.

*Urmston.*—The foundation-stone of new schools, in connexion with the Bridgewater-street circuit of the Wesleyan Methodist body, situated in Urmston-lane, Urmston, Stretford, has been laid. When finished, the schools will accommodate 250 children, in classes; and when used as a chapel, as it will be until the requirements of the village demand greater accommodation, it will seat more than 300 adults. There is one room, 58 ft. by 30 ft., internally, and three class-rooms, the largest of which is 18 ft. by 15 ft. The style of architecture will be a simple and early type of Gothic. One of the principal features in the building will be a bell-tower, 60 ft. high. The cost of the structure is expected to be about 1,750*l.* The architects are Messrs. Fuller & Cubitt, of London; and the builder is Mr. Mark Foggett, Cheetham.

## PROVINCIAL NEWS.

*Torquay.*—A building of considerable architectural pretentions has just been erected on the site of a house recently taken down upon the Strand. The building is erected almost entirely of warm-tinted Hamhill stone, the springers and alternate stones of the window arches being of worked limestone. The style of architecture is what has been called Victorian, being of a freely treated classical type, and supposed to be well adapted for street architecture as well as for domestic purposes. The whole of the works have been executed with rapidity. The shop front is of bronze, and, with the revolving shutters, has been made and put up by Messrs. Bunnett & Company, of London. The bronze sashes are surmounted by ornamental capitals, with spandrels in the same materials. The columns to the mullions of the first-floor windows are of red Dartmoor granite, which is like Aberdeen granite. The capitals and keystones on each story are carved, and the pilasters to the upper windows are further enriched by the introduction of carved festoons of flowers Under these windows, again, is a series of colossal busts, in circular panels. The two central ones are female heads, emblematic of "Peace" and "Plenty." The others display a variety of subjects. A helmeted bust dedicated to "War," resembles Bismarck. An old bearded and thoughtful head is entitled "Science." Mr. J. Watson, of Torquay, was the architect of the building, and Mr. Peter Blampey, of Torquay, the contractor. The cost is something like 2,000*l.* The sculpture and the other stone carving are from the chisel of Mr. Harry Hems, of Exeter.

## FROM SCOTLAND.

*Rosslyn.*—An improvement has been carried out by the County Road Trust in the formation of an iron bridge over the North Esk, which has just been completed by Messrs. Gibson & Tate, Bainfield Ironworks, Edinburgh. It is of malleable iron, and is made to carry heavy traffic. It has been erected under the immediate personal superintendence of Mr. Gibson. The bridge is constructed on the lattice-girder principle, and measures 128 ft. long, in two spans of 64 ft. each, by 16 ft. wide, supported in the centre on one stone pier. The lattice-girders stand 6 ft. high at the highest part, and consist of two heavy T beams, bound together by lattice-work. The table of the lower T beam of the two lattice-girders forms the rest for the transverse beams, which consist of malleable iron H girders, on which the flooring—of creosoted red wood planks—is laid, with a skifting 12 in. deep, and topped with a layer of Mitchell's concrete. The work has been executed after the design and drawings of Mr. E. Elmslie Sang, C.E., Edinburgh.

*Dalkeith.*—While three men were engaged in taking down a wall in White's-close, it gave way at the foundation, and, falling upon the men, completely buried two of them. The wall was part of an old building which Mr. Ritchie, builder, Bonnyrigg, was employed to remove for the purpose of making way for the erection of a new house. The wall was 11 ft. high, upwards of 30 ft. long, and from 1½ ft. to 2 ft. thick. At first they commenced to take the wall down bit by bit, but finding this a difficult task, they resolved to undermine the ground on the one side near the foundation, and try by this means to at once bring the fabric to the ground. It was while they were proceeding with the undermining operations that the whole stretch of masonry fell. The work of extricating the two sufferers from the rubbish was speedily effected. Neither of them, though they had sustained serious bruises, had bones broken.

*Dundee.*—A gable, 50 ft. high and 20 ft. wide, above the side wall of a new house building in Dundee, was blown down lately by a violent gale. The falling wall knocked down an adjoining house, in which two families lived. The occupants of one house left before the accident, and so escaped; but the other family, consisting of five persons, were overtaken by the falling stones. Two were killed in bed; the others were only a little injured.

## STAINED GLASS.

*Chesterfield Church.*—Mr. Constable has been commissioned to execute in stained glass the west window of this church, as a memorial of the late Rev. Alexander Poole, B.A., the first incumbent of the church. His design was selected from several others in competition.

*Lesmahagow Church (Scotland).*—A large work in stained glass, executed by Messrs. Ballantine & Son, of Edinburgh, has been fitted up in their saloon, George-street, on view previously to its removal to Lesmahagow parish church. There are three upright compartments, with a semi-circular space above stretching over the entire width of the three lights, forming together a window of the Italian classic style. The illustrations are all taken from the works of eminent masters in sacred art. The central compartment contains the Descent from the Cross, adapted from the celebrated picture by Rubens in Antwerp Cathedral. The figures are nearly life size. In the compartments on either side are figures of Moses and St. Paul, the former adapted from Michelangelo, and the latter from Raffaelle. In the large arch inclosing the upper part of the window is the Ascension, by Raffaelle. The donor of the window was Mr. J. B. Greenshields, of Kerse.

## PATENTS CONNECTED WITH BUILDING.

IRRIGATION CONDUITS.—*H. Doulton.* Dated 1st December, 1870.—The bottom or invert of the conduit or channel is formed of an earthenware trough obtained by dividing a socket or butt pipe into two equal parts longitudinally. The division is partly made before the pipe is burned, by preference, by knives or sharp edges attached to the dies, and the separation into two troughs is afterwards completed. The upper parts of the conduit or channel are formed of angular tiles made with longitudinal passages through them to lighten them and to cause them to burn better. These angular tiles also are first made as pipes which are partly divided before burning, and the separation is completed afterwards. One face of each angular tile forms the coping, and the other the side or wall of the conduit or channel. The invert and sides may be laid on concrete, or, where the soil admits, they may simply be laid in a suitable trench with supporting bricks on either side to sustain the coping.

WALLS.—*G. Marshall.* Dated 24th March, 1871.—The novelty of this invention consists in building walls 9½ in., with considerably less material than is now used in ordinary 9-in. walls. These walls have also the advantage of being hollow, thus rendering the buildings free from damp. The extra length in the brick and the square section are also features of novelty.

WINDOWS FOR MANUFACTORIES.—*T. G. Webb.* Dated 28th March, 1871.—This invention relates to making windows of pressed blocks of glass fitted with "butt" joints.

WATER-CLOSET CISTERNS.—*T. Hall.* Dated 29th March, 1871.—The inventor constructs cisterns without valves, and instead he divides the cistern by a water-tight partition, not quite the full depth of the cistern, and on the top edge of this partition he hinges a trough or dish. This trough is arranged to lie in a horizontal position over one of the compartments which is provided with an ordinary ball tap for supplying the cistern with water in the usual manner, and a small hole is made in the bottom of the trough, so that water will pass through the said hole and rise in the trough in the same level as the water in the cistern. An outlet pipe is provided in the other compartment of the cistern to which the pipe to conduct water to a closet is to be connected. A lever and wire or cord is attached to the trough or dish, and when a discharge of the water is required to the closet by actuating the communicating wire or cord, either directly by hand, or by arrangement with closet-seat, or by a lever and handle as heretofore, the trough will be tilted or tipped, and the water therein thrown over into the discharge compartment, from whence it will pass to the closet, and the trough by its own gravity will rectify itself and become refilled ready for the next occasion required.

HEATING APARTMENTS.—*T. E. Clarke.* Dated 29th March, 1871.—The object of this invention is to increase the heating surface of open and closed fireplaces, and thereby to utilise a larger percentage of the heat given off by the burning fuel than is at present obtained from open and closed fireplaces used in the heating of apartments.

COOKING RANGES.—*H. E. Mines.* Dated 28th April, 1871.—The invention consists in carrying off the smoke and products of combustion from close ranges by a flue or flues separate from the chimney or passage through which the effluvium from the cooking escapes, so that the latter passage can always remain open without interfering with the draught of the fire.

LOCKS AND LATCHES.—*J. Imray.* Dated 1st May, 1871.—Construction of mortise locks or latches having tubular casings capable of being inserted in round holes, with means of increasing the stroke of the bolt. Construction of spring latches with sliding or rocking bolts acted on by the pull or push of the knobs or handles, and modification of the same for being acted on by turning the knobs or handles.

WINDOW GLASS.—*W. V. Baines.* Dated 2nd May, 1871.—This invention consists in making glass for windows in lengths, with an ornamental border or edge at or near the top side.

CONCRETE BUILDINGS.—*H. Bird.* Dated 3rd May, 1871.—According to this invention, a mould, or part thereof, is formed of slabs or plates, or ornamental or plain pieces of glass, opaque or transparent; concrete is filled into this mould, and the slabs or plates form a permanent facing to the wall. When it is desired that the concrete should not adhere to the mould, paper is interposed.

CONSTRUCTION OF WALLS, FLOORS, &c.—*E. Chadwick.* Dated 3rd June, 1871.—Walls and floors are made of tiles rebated at the edges, so as to be joined together laterally, and held by means of cross ties.

ILLUMINATING GRATINGS AND GLASSES FOR THE SAME.—*T. Hyatt.* Dated 3rd June, 1871.—This invention relates to various combinations of glass and steel, or other metal for forming illuminating roofs and gratings; also to the introduction of wire netting into the plates and glasses; also to inserting the glass directly in such gratings in a heated plastic state; also to the use of Portland or other like cement for fixing in the glasses in conjunction with putty; also to the "chilling" the glass protecting metal knobs of illuminating gratings; also to the combination of corrugated metal and plain glass, or *vice versâ*, for ventilating purposes, and the use of removable cup-shaped glasses on illuminating metal roofs for the same purpose; also to the construction of illuminating mosaic lights composed of glass, fitted together flush at the edges on a metal frame, and retained in place either by rebating the glass, or by the use of undercut knobs or projections at the intersecting angles in the grating.

LOCKS AND KEYS.—*H. E. Hutchins.* Dated 8th June, 1871.—According to this invention the bolt of the lock is retained in its unlocked position by a lever and spring, the former having at one end a rounded nose taking into an indent in the bolt. When the bolt is in its locked position the nose of the lever is pressed into a slot in the bolt. The other end of the lever is formed with a slot wherein works a pin on a screw catch which slides in the key-tube. The key is made in two parts, one within the other, or the key is of usual construction, and a catch attached to it, or a slit is formed in the end.

IRON SHUTTERS.—*H. R. Minns.* Dated 8th June, 1871.—The features of novelty of this invention consist in connecting the edges of the strips or laths of iron shutters together by bending or turning over the edges, so that they shall hook or lock into each other; also in so connecting together the said strips or sections of a shutter as they shall slide and lie side by side when out of use in a box formed to receive them.

MANUFACTURE OF FIRE-BRICKS, &c.—*S. J. Payne.* Dated 5th December, 1871.—A mixture of siliceous sand and what is commonly called London loam with plastic clay, pipe clay, or potters' clay, flint, or flint gravel, with an addition, either in the mixture of the materials or by rubbing or dipping the made goods in any stage of their manufacture, with a powder, or into a solution, composed of calamine, lime, and cement. The inventor does not intend to confine himself to any definite proportions of the materials, but desires to use them in such manner and way as he shall find it suitable to make any articles required, either burnt or unburnt, wet or dry.

## Books Received.

*Queen Charlotte Islands: a Narrative of Discovery and Adventure in the North Pacific.* By FRANCIS POOLE, C.E. Edited by JOHN W. LYNDON. London: Hurst & Blackett. 1872.

MR. POOLE, who had been engaged in prospecting and mining operations in Canada, proceeded in 1862 to Victoria, the capital of Vancouver Island, off the coast of British Columbia, where he was engaged, after a severe prospecting tour, as mining engineer to a new company, named the Queen Charlotte Mining Company, for turning to account the valuable mineral resources of the Queen Charlotte Islands, lying, like Vancouver Island, off the coast of British Columbia. The speculation was not successful; the "white savages," as Mr. Poole calls them, whom he took with him to commence the work, having struck work,—or mutinied, rather, in the face of hostile Indians, and in a locality where there was not a single white man in existence besides the blockheads themselves, and their employer, Mr. Poole. The Indians, of course, took advantage of this squabble among the white men; and, although some of them were both friendly and faithful, it was with difficulty that Mr. Poole wound up the scheme and retired from the contest, as it may be fitly enough called.

The author having since suffered much from a broken constitution, has been unable to prepare his careful diaries for the press, and this Mr. Lyndon, author of "Ninety-Three; or, the Story of the French Revolution," has done for him; the result being an entertaining story of adventure and discovery connected with a British territory which has never advanced even to the title of a British colony, although it has been in our possession now for about 100 years. Yet the islands are said to form a healthy and picturesque district, rich in natural resources, and well adapted for colonization, as this volume shows. "Even the Admiralty survey is still wanting. There they lie, waste and fallow, yet marvellously productive, and awaiting nothing but Anglo-Saxon capital, enterprise, and skill, to return manifold profit to those who will embark in the venture."

## VARIORUM.

THE last number for the present year of *Nouvelles Annales de la Construction* (49, Quai des Augustins, Paris) includes some notes on the reconstructions now going on in the French capital, with illustrations showing the aspect of certain blocks after the fire, and the aspect that has now been given to them.——*Il Politecnico* (7, Via Lupetta, Milano) addresses itself to engineers and architects, and will be found interesting and useful by those who desire to know what is being said and done in Italy.——The current number of the *Leisure Hour*, speaking of "Brummagem Jewelry," says:—"An article was formerly made by one man; the gold was beaten out by him to the thickness required, and hammered into the proper form; the edges were filed that they might join correctly, and it was then soldered and completed. Now, many persons are employed, and many articles of a kind produced together; the gold is rolled by steam to the proposed gauge, blanks are cut out and struck to shape on a die by the screw-press, and the several parts have then only to be put together and 'finished.' In the 'gilt toy' branch, the aim is to produce good and cheap imitations of fine and costly jewelry, and the die and the press easily effect this. A locket worth from fifteen to thirty shillings in gold can be manufactured in gilt metal for a penny; and one which some time since had a considerable run, and was made with hinges and clasp in the form of a book, with good likenesses of the Prince and Princess of Wales, was sold wholesale for about a halfpenny."——The "Household Edition" of the Works of Charles Dickens has now reached its seventh part.——"Warne's Cookery Book for the Million" gives a considerable amount of information for a penny.——Cassell's "Illustrated Almanac"; *Old Merry's Monthly* (Warne), and *Little Folks*, only need naming: the last is a capital journal for children.——"London to Lancashire, with a preface by Sir Charles Trevelyan. Bell & Daldy, Covent-garden. 1872." This penny pamphlet is a reprint of recent letters, &c., relating to the existing demand for the labour of women and children in Lancashire, by which, under the auspices of Mr. Hollond, of 139, Belgrave-street, Stepney, and other gentlemen, London young women, widows, and children, have already greatly benefited.

## Miscellanea.

**The Relation of Science to Agriculture.** At a special meeting of the Newcastle Farmers' Club a paper by Mr. J. J. Stockley, consulting engineer, Harton, was read. It was the first of a series, and related chiefly to the advance of agricultural chemistry from the time of Davy, when for the crude ideas on the application of chemical science to agriculture hitherto held was substituted true and demonstrable philosophy, opening out a field of research and inquiry that has engaged the best efforts of some of the master-minds of the last and present generation. Then followed improved agricultural mechanism, crowned by the application of steam as the motive power; and we have now a combination of practical and theoretical skill at work in the interests of the masses, which has so rapidly expanded and altered the art of cultivation as to give rise to the hopeful expression, "Notwithstanding all that has been done, agriculture is still in its infancy." If this be true, it affords a cheering prospect to those who, looking on agriculture as a profession, see full scope for all their energies and powers of observation, coupled with a fair chance of substantial reward for every judicious and well-matured step in advance.

**Interior of a Greek Church in Hungary.** The inside of the church, as is generally the case with those of the Greek persuasion, was very bare, and without the smallest division in its aisles. It was also without any seats in the middle. It was divided by two screens into three parts. The screen to the east was of iron, and much the most elaborate. It entirely concealed the altar, which, however differed little in appearance and ornament from that of a Roman Catholic Church. Between the two screens there were seats or stalls against the wall, those nearest the altar-screen projecting forwards, and being altogether distinct. One was intended for the bishop. There was also a reading-desk, and a place for the choir. With these exceptions, the floor was unoccupied, and entirely without benches or chairs. The books of the service were in the old Romaic character, a curious mixture of Greek and Sclavonic, nearly incomprehensible to me. This character is not much used in modern printed books, but is always found in inscriptions, and also in books of any antiquity. The portion of the church behind the altar-screen (corresponding with the choir in our churches) appeared to be used partly as a vestry and partly for the performance of some services out of sight. The various vestments were hanging up behind the screen, and there was no attempt at order or arrangement. There was a table used for registry and other purposes where writing is required. The altar was prepared for use, with candlesticks, &c., but without decoration, and the whole affair seemed as little effective as possible. None but the priests are in this part of the church, in sight of the congregation. The screen at the end opposite the altar was low and incomplete. Behind it was a miscellaneous collection of banners and other apparatus for processions and various odds and ends for church purposes. Here, also, everything was disorderly and dirty. Several pictures in frames were placed here, and these are put out on stands or easels when service is performed, for the worship of the people. They were mere faces, with a background of gilding. The walls of the central part of the building I observed to be decorated by pictures, painted in fresco, in imitation panels. These frescoes represent, with a rude attempt at perspective, some of the events of our Saviour's life, and the history of certain favourite saints. They were modern, and not worse than similar works in Roman Catholic parish churches in country villages in France and Germany.—*Anstead's Short Trip in Hungary.*

**Erection of a New Dispensary at Lower Norwood.**—The Lambeth Guardians, acting upon the powers conferred upon them by the Metropolitan Poor Act of 1867, have just decided to erect a large dispensary at Lower Norwood for the whole of that portion of the parish of Lambeth comprised between Weston-hill on the south, Tulse-hill on the north, Rosendale-road on the east, and St. Julian's-road on the west, and which covers an area extending over several miles. We understand that the guardians have resolved that the building shall be a handsome architectural edifice, containing an ample number of apartments and offices not only for the more immediate purposes of dispensing, but also for the residences of the medical men in charge, and also for the accommodation of patients.

**New Buildings in South London and Imperfect Drainage.**—A subject of serious importance, in connexion with the sanitary condition of South London has just come to the knowledge of the local authorities, and which, it is said, accounts to a great extent for the lengthened continuance of typhoid and other fevers in the district. It is stated that a very large number of new buildings, even in the principal thoroughfares, are not connected with the street sewer. If this be correct, a heavy responsibility attaches to those who let houses with a knowledge of this state of things, and it behoves all persons who take new houses to look to their drains.

**The Metric System.**—The Lord Mayor has received at the Mansion House a deputation of gentlemen connected with the City, to present a requisition requesting him to hold a meeting at the Mansion House in favour of the adoption for public use of the metric system of weights and measures. The Lord Mayor expressed his sense of the importance of the subject to such a city as London, and granted the use of the Egyptian Hall for a meeting on Wednesday, January 17, promising to preside.

**Bells for St. Peter's, Ashton.**—A presentation has been made of a peal of bells to St. Peter's, Ashton, by Mr. George Heginbottom. The bells were made by Messrs. Mears & Stainbank. The peal is to be hung by Mr. Thomas Hooper, of Woodbury, Devonshire. The flooring of the belfry has been entirely renewed for their reception with oak timber, and the beams strengthened with boiler-plates, by Mr. Crabtree, of Ashton. The large bells are cast without canons, which fasten the bell to the stock, and also without staples under the crown. These are usually left on to couple the clappers to. This makes a considerable difference in the weight of the bells, and reduces the tenor to 19½ cwt., which, if made with canons, &c., would be 20 cwt. The bells are fastened to the stocks, and the clapper staples are made of strong Low Moor wrought iron, made by Mr. John Povey, of Ashton. This is considered an improvement, and renders the bell more perfect in the solidity of its metal, as by leaving off the canons in the casting it dispenses with the difficulty of cooling an unequal thickness of metal. The gross weight of the peal is 80 cwt. 0 qr. 4 lb. The cost of the bells, exclusive of hanging, headstocks, wheels, frames, &c., is 560*l.*, and the clappers will cost 10*l.* 10*s.* extra. The whole of the cost, with other incidental expenses, will amount to about 950*l.* gross, but 100*l.* will be allowed for the old bell.

**Death of the "Manchester Peabody."**—We have to announce the death of Mr. Robert Barnes, of Manchester. Mr. Barnes, who was seventy-one years of age, had been in delicate health for some time, and died rather suddenly on Monday morning at his residence, Oakley, Fallowfield. Intended originally for the English Church, Mr. Barnes early became connected with a cotton-spinning business, and succeeded, while yet in middle age, in realising a very large fortune. This to him, however, meant, more than anything else, the opportunity of alleviating human suffering. Among the various charitable enterprises with which his name is bound up is the Convalescent Home at Cheadle, towards which he paid 26,000*l.*; the Industrial Training Home for Outcast Children at Heaton, Mersey, towards which he laid out 14,000*l.*; and the House of Recovery at Monsal, towards the establishment of which he gave 9,000*l.* During the period while he was mayor of Manchester, he erected numerous drinking-fountains over the city; and he likewise altered and added greatly to the Bridgewater-street Wesleyan Chapel there.

**Telegraphing by Telegraph Cards.**—The idea was recently started that a system of post-card telegrams might be adopted, which would prove a boon to the general public. A pattern card was ordered, and has been approved of. On the one side it bears an impressed shilling stamp, with printed directions,—as in the case of a post-card,—that the address of the person for whom the message is intended should be written on that side. On the other there is a space for the name and address of the sender, and fine lines ruled for four words each, which are to constitute the message of twenty words. An order for an immense number of these cards has been issued, and they are at this moment being printed, and will shortly be for sale. A card may be dropped into the nearest pillar-box, and one of the regulations in connexion with this new system will be that immediately on receipt of the message at the post-office to which it is taken it shall be "wired."

**Torquay Drainage.**—An address to the ratepayers of Torquay by Mr. E. Appleton has been printed and circulated. The local Board's scheme is to turn the sewage into the sea at Hopeshore, near Mendfoot, at a cost of 30,000*l.* (Mr. Bazalgette engineer). The author, in common with many others, is at a loss to reconcile Mr. Bazalgette's present scheme with his recommendations in 1868; hence the present address. Mr. Appleton urges the utilisation of the sewage by irrigation, and points out how it can be done at Torquay, making use of Mr. Bazalgette's estimates, &c. "Let us, then, pause," says, Mr. Appleton, "and consider well whether we be wise in adopting a scheme which will cast into the sea—and perhaps cause a nuisance—that which we are informed, on the highest authority, is intrinsically worth upwards of 7,000*l.* a year." He refers to the rumour that Government are to bring in a Bill to enable money to be borrowed for sewage works, and repaid by small instalments running on to seventy-five years.

**The Amalgamated Society of Engineers.** We extract the following from the monthly report for December:—"We have much pleasure in submitting this month's report, inasmuch as the returns from which it is compiled are clearly indicative of the continued prosperity of our trade throughout every district in the kingdom. This month our entire number on donation benefit is 262; whereas in last month's report it was 235. This small increase of twenty-seven is nothing in comparison with what might have been reasonably anticipated from the approaching close of the year, and the casual stoppages caused by the nine-hours movement. As this is our last monthly report for 1871, we take the opportunity of reviewing our position as a society, in order to show how prosperous it appears as compared with a few previous years. In December, 1867, the number on donation benefit amounted to 3,129; in 1868, to 2,771; in 1869, to 2,420; and in 1870, to 969; whereas, as stated above, at present it is only 262; add to this our rapid increase during this year, which has already been augmented by 2,810 members, and it will be seen that we have abundance of reason to be thankful for our present position. We may add that we have every reason to believe that nearly the whole of the employers throughout the trade will have conceded the nine hours by the 1st of January, 1872. It is gratifying to find that this reduction in the hours of labour has been attained without weakening the good feeling between employers and workmen."

**Pre-Historic Fortifications.**—At a meeting held recently of the Archæological Section of the Midland Institute, Birmingham, Mr. Lawson Tait delivered an address upon "Pre-historic Fortifications." The president (Mr. S. Timmins) occupied the chair. Mr. Tait, after some introductory remarks, observed that the first indication of fortification was what they might naturally expect, viz., a fortified hillock, men finding that upon an elevated position they had an advantage in the use of their weapons. Thus they found that the earlier fortifications were hill forts. The well-known Roman forts with which this country abounded, were not such as he classed amongst pre-historic fortifications, because pre-historic meant such as they had no historic knowledge of. In the earliest times, he believed that the first structures were not intended for permanent residence, as forts now were.

**Materials for Paper.**—At the last meeting of the Society of Arts a paper was read by Mr. Robert Johnson, "On Esparto," including practical remarks on the nature, cultivation, past history, and future prospects of the plant; also, on the importance to the paper-making trade of prompt and vigorous measures for its preservation. Various speakers followed the reading of the paper, and from the general observations made it appeared that, as it took about fifteen years to bring the plant to maturity, the establishment of new esparto-growing districts would not bring the relief to the paper trade which was required in providing an immediate supply of some cheap and good material. The fibre of wood had been tried, but proved, it was said, a failure, and must be regarded simply in the light of adulteration, the same as china-clay.

**The Milkwood Hall Estate at Brixton.** The large estate near Loughborough-road, between Herne-hill and the Brixton-road, formerly known in connexion with the Suburban Dwellings Company, but which has now been named the Milkwood Hall Estate, has just been laid out by Messrs. Habershon & Pite, architects, for the erection of a good class of houses; and the estate, which is upwards of nine acres in extent, will shortly be covered with dwellings, several hundreds in number. The contract for the construction of the sewers, drains, and roads, has just been let, the lowest tender out of thirteen sent in being 2,048*l.* by Mr. Bloomfield.

**Fall of a Chimney in Havre.**—A telegram, dated December 22, says:—"Last evening, during a storm of extreme violence, a colossal chimney situated at the side of the principal court-yard of the spinning-mill known as the Filature Courant, belonging to MM. Courant & Co., in the Rue Demidoff, constructed of masonry and weighing 30 tons, was severed at its base by the force of the wind, and fell with a violent shock upon the workshops surrounding the court-yard. Several persons were killed, and the material damage amounts to 300,000 francs.